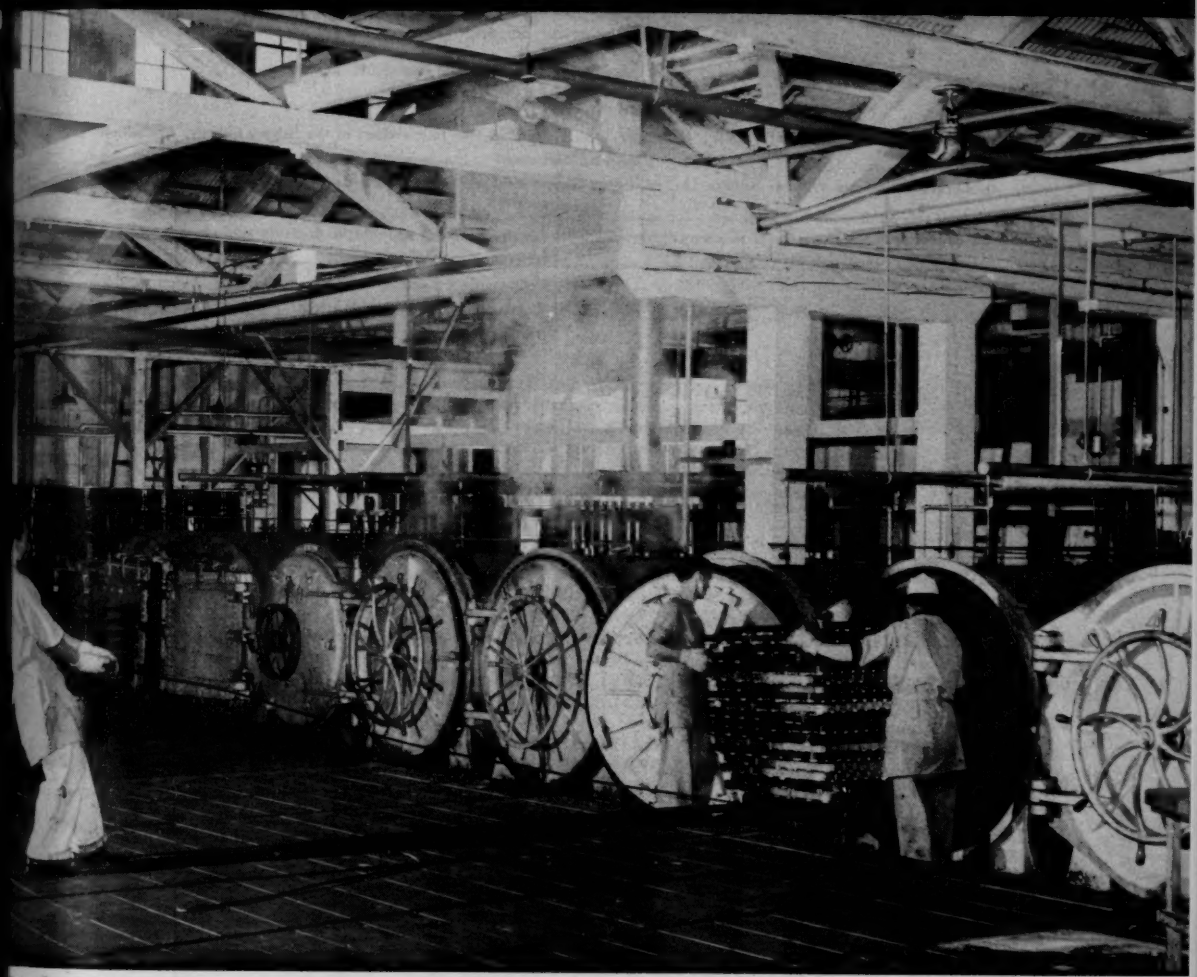
COMMERCIAL FISHERIES REVIEW

Formerly "FISHERY MARKET NEWS"



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COMMERCIAL FISHERIES REVIEW

A REVIEW OF DEVELOPMENTS AND NEWS OF THE FISHERY INDUSTRIES
PREPARED IN THE DIVISION OF COMMERCIAL FISHERIES

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Applications for COMMERCIAL FISHERIES REVIEW, which is mailed free to members of the fishery industry and allied interests, should be addressed to the
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Cover: In April, preparation for the Columbia River salmon pack gets well under way. The packing season begins early in May. These retorts, used to cook the salmon after it is packed and sealed in the can, are located in one of the larger canneries in the area.

Source - Office of War Information.

COMMERCIAL FISHERIES REVIEW

April 1946 Washington 25, D. C. Vol. 8, No. 4

FISH FOR BREAKFAST--AND WHY NOT ?

By Kathryn L. Osterhaug*

Fish for breakfast--and why not? Is there anything incongruous about serving a broiled fillet preceded by a chilled grapefruit and accompanied by a stack of toast and a pot of steaming coffee? The sports-fisherman knows the delicious possibilities of pan-broiled freshly-caught trout for breakfast. Why not give the jaded appetites of the home-folks a lift with a similar succulent morsel? Perhaps the reason that those few minutes extra sleep seem preferable to breakfast is that the breakfast menu has become drab and monotonous. Orange juice, toast and coffee has become standard fare for large groups of our population. Probably as a result of this has developed the habit of a mid-morning pick-up, usually consisting of a sweet roll and more coffee. Half the day gone and only a minute amount of the daily nutritional requirements have been satisfied.

Isn't that an absurd state of affairs when at least half of the day's work is done during the morning hours? One group of people who do not follow this breakfast plan is the farmers. They eat hearty breakfasts including foods high in protein because they KNOW they need it.

More and more emphasis is being placed on the value of ample amounts of protein in the diet. Doctors have found that wounds heal more quickly and that people have more resistance to infection when their diets are high in protein. Another result of protein in the diet is a sense of well-being, said to be directly attributable to the maintenance of a high blood sugar level. The lack of protein in the morning meal probably accounts for that mid-morning let-down of which we have spoken, for investigators have found this to be a characteristic aftermath of meals which are high in carbohydrate and low in high quality protein.

Nutritionists agree that from one-fourth to one-third of the daily food requirements should be eaten at the morning meal. This does not refer alone to the energy requirements, but includes the other food essentials such as vitamins, minerals, and proteins.

The problem of the homemaker or meal planner, then, is to provide her family with a satisfying breakfast which supplies the essential food factors, pleases the palate, and is still economical. The national standby of bacon and eggs is all very well, but some people find that such a breakfast dish is too rich and, in any case, the possibilities for variety are strictly limited.

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Aside from nutritive value, what is required of a good breakfast dish? Probably the most important requirements are ease and speed of preparation. Breakfast dishes should have mild but distinctively pleasant flavors; the ingredients should be easily available and economical. What other protein food not already commonly used for breakfast fulfills these requirements better than fish?

Fish is a high-quality protein food abundantly supplied with vitamins and minerals. The average individual serving of a seafood supplies one-quarter or more of the daily protein requirements. Fish are good sources of the B vitamins, thiamine, riboflavin, and niacin, and certain species are particularly valuable for their A and D vitamin content. Herring and sardines are good sources of vitamin D, and the roe of fish is an excellent source of vitamin A. Seafoods in general are well known for their ability to supply the essential minerals, iodine, iron, and copper.

In addition to nutritional qualifications, fish have other important advantages as breakfast dishes. They cook rapidly and, when fresh and properly handled, have a delicate yet distinctive flavor. The economy of fish depends to some extent on the skill and judgment of the purchaser. Most people have become accustomed to, and demand, only a few species of fish which are comparatively scarce, and which, therefore, demand a higher price. If the homemaker were to shop around, she would find any number of less well-known but equally delicious fish and at a lower price than she is accustomed to paying. Even the inland markets may now boast a large variety of constantly available seafood due to the rapid development of the quick-freezing industry and to the growth of the otter trawl fishery.

When first confronted with the idea of fish for breakfast, one may wonder how to fit them into the more or less standardized breakfast menu. Codfish cakes, kippered herring, and finnan haddie have long been accepted breakfast fare in certain localities and by certain groups of people, so the fish for breakfast idea is not really new and strange. A few sample menus and recipes may serve as an inducement for serving seafood at breakfast, and when the success of the introduction merits it, the housewife will continue its use and will herself employ fish to create a variety of breakfast dishes.

Breakfast Menus

Fresh Raspberries

Cream

Broiled Small Rockfish Fillets

Buttered New Potatoes

Melba Toast

Coffee

Recipes

Broiled Small Rockfish Fillets
(Serves six)

2 pounds small rockfish fillets
1 teaspoon salt
¼ teaspoon pepper
¼ cup melted fat
1 teaspoon lemon juice
Paprika

Sprinkle fillets on both side with salt and pepper and let stand for ten minutes to absorb the salt. Lay the fillets on a preheated greased broiler pan. Brush the surface with a mixture of the melted fat and lemon juice. Sprinkle with paprika. Place the fish in broiling oven about two inches from the heat, cook three to five minutes or until slightly browned. Turn and repeat the process. When browned remove to heated platter and serve.

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Breakfast Menus (Cont.)

Pineapple and Grapefruit Juice

Clam-Corn Griddle Cakes

Bacon

Coffee

Sliced Fresh Peaches on Cornflakes

Cream

Fish Flakes in Ramekins

Whole Wheat Muffins

Butter Honey

Coffee

Chilled Grapefruit & Orange Sections

Kedgeree

Cornbread

Butter Raspberry Jam

Coffee

Apple Sauce

Sablefish Hash

Crisp Toast

Butter Apricot Jam

Coffee

Recipes (Cont.)

Clam-Corn Griddle Cakes

1 one-half pound can minced clams, drained
¾ cup sifted all-purpose flour
½ cup yellow corn meal
2½ teaspoons baking powder
1 egg, beaten ½ teaspoon salt
Liquor from clams plus enough milk to make ¾ cup liquid
3 tablespoons melted fat

Sift together the flour, baking powder and salt. Combine the clams, egg, liquid, and melted fat, add to the dry mixture all at once and mix until all the flour has been moistened but not until the batter is smooth. Bake as regular griddle cakes and serve with butter or substitute.

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Fish Flakes in Ramekins
(Serves six)

2 cups cooked fish, flaked
4 tablespoons melted shortening
4 tablespoons flour
½ teaspoon salt ¼ teaspoon nutmeg
2 cups top milk
1 tablespoon lemon juice
2 hard-cooked eggs, chopped
½ cup flaked cereal, crushed

Blend melted shortening, flour, salt, and nutmeg in a saucepan. Stir in the milk and cook until thickened. Add the fish flakes, lemon juice and eggs, place in individual oiled casseroles or custard cups, cover with crushed cereal and bake 20 minutes in a 350° F. oven.

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Kedgeree

2 cups flaked smoked fish
2 cups fluffy cooked rice
4 chopped, hard-cooked eggs
1/3 cup butter or substitute
1/2 cup top milk
1/8 teaspoon pepper Salt to taste

Combine all ingredients and heat in the top of a double boiler. Serves 4 to 6.

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Sablefish Hash

2½ cups flakes, cooked sablefish
¼ pound bacon, diced
2½ cups boiled potatoes, chopped
1 tablespoon minced onion
1 teaspoon salt 1/8 teaspoon pepper

Fry the bacon until golden brown and crisp. Mix the bits of bacon, sablefish, potatoes, minced onion and seasonings together and place in the pan with the fat. Fry until brown. Fold over and serve like an omelet.

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Breakfast Menus (Cont.)

Tomato Juice

Pan-broiled Fish Roe and Bacon

Buttered Toast

Apple Butter

Coffee

Recipes (Cont.)

Pan-broiled Roe and Bacon
(Serves six)

1 pound fish roe
½ pound bacon
1 quart water
1 tablespoon salt
1 tablespoon vinegar

If roe is large, cook for 20 minutes in simmering water to which the salt and vinegar have been added. Be sure that the water covers the roe. Pan-broil the bacon until crisp and drain on absorbent paper. Drain the pre-cooked roe and cook slowly until browned in a little of the bacon fat. Serve roe and bacon on toast.

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SCALLOPS

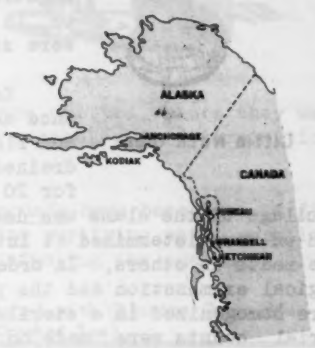
Scallops taken along the Middle Atlantic Coast are of two kinds: sea scallops and bay scallops. Production of sea scallops in the waters of this area is small, but about two million pounds, chiefly taken in New England, are landed at its ports. Small but intensive fisheries for the bay scallop exist in Rhode Island, Long Island, and North Carolina. Virginia formerly produced several million pounds of bay scallops and New Jersey a smaller amount. However, the scallop fisheries in these and many other areas disappeared early in the 1930's simultaneously with the destruction, by a mysterious disease, of the eel grass in which the young scallops shelter. The only portion of the scallop--either bay or sea--that is eaten is the large muscle that controls the movements of the shells. Sea scallops are taken by dredging, sometimes at considerable depths; bay scallops in shallow water by dredges, rakes, or dip nets.

--Conservation Bulletin No. 38

PRESERVATION OF SHUCKED ALASKA CLAMS

By Frank Piskur and Maurice E. Stansby *

Because of the depletion of the clam beds in Washington and Oregon, there is an unsatisfied demand for fresh clams in the markets of the Pacific Northwest. Abundant supplies of various clams are located in Alaska. Butter clams are taken in Southeastern Alaska and razor clams in the vicinity of Cordova. The greater part of the annual yield of these species is canned commercially, and only a small portion is sold fresh. Because freshly-shucked clams spoil readily, even at temperatures as low as 32° to 34° F., it is impossible to ship them to distant markets in a fresh condition.



It was the purpose of this investigation to develop methods for handling and storing fresh Alaska clams which would permit their distribution to markets on the Pacific Coast and possibly farther inland.

Very little work has been done on the preservation of fresh clams, although in recent years, there have been several reports on the preservation of fish and fish fillets. Chen and Fellers (1926) reported that ice containing 0.02 percent available chlorine was effective as a perservative for fish. Stansby and Griffiths (1936) showed that whole haddock stored in CO_2 from the time they were caught kept approximately twice as long as those stored in air. Tarr and Sunderland (1938) demonstrated that dips in 20 percent brine, containing 0.1 percent benzoic acid, exerted a favorable effect on the keeping quality of fillets and that this action was not improved by the addition of other acidic substances. The addition of citric acid, lactic acid, or potassium acid phosphate to the brining solution did not appear to improve the keeping quality of smoked fish. Tarr and Bailey (1939) found only a slight improvement in the keeping quality of dressed halibut and black cod which were stored in crushed ice containing 0.1 percent benzoic acid. Fellers and Harvey (1940) showed that benzoate treatment of fish fillets improved their keeping quality. In a later report, Tarr and Sunderland (1940) reported that ice containing small amounts (0.1 or 0.5 percent) of sodium nitrate was a markedly better preservative than ordinary ice.

Clams were obtained at five beaches near Ketchikan, Alaska:

Refuge Cove Mud Bay Peninsula Point Rosa Reef Mountain Point

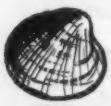
These beds are situated five to seven miles from the city, so the clams were considered free of contamination from sewage and waste. The species found, in the order of their predominance, were butter clams (Saxidomus giganteus), Little Neck clams (Paphia staminea), cockle clams (Cardium corbis), horse clams (Schizothaerus nuttallii), and mud clams (Mya arenaria). With the exception of one test with mud clams, only butter and Little Neck clams were used in the experiments.

As soon as they were dug, the clams were washed in fresh water and placed in a tank containing sea water, or 2 percent brine. A small amount of corn meal was

* Chemists, Seattle Fishery Technological Laboratory.

added to the brine, and the clams were allowed to cleanse themselves for 8 to 10 hours by replacing sand with corn meal. This is a practice commonly used by some of the local clam canneries. The clams are then washed again and opened by hand. After being washed in fresh water, the meats were placed in a jar surrounded by crushed ice.

The meats were weighed into 8-ounce, wide-mouthed, screw-capped jars and covered with a definite volume of test solution. That is, 100 grams of clams was added to 100 ml. of storage solution, except that in Series C of Table 3 (see p. 8) the proportion of clams to storage solution was varied. Each sample was prepared in triplicate, or, in some cases, in quintuplicate, and the covered jars were stored at 32° to 34° F.



Little Neck Clam

Keeping quality of the raw clams was judged by appearance and odor. Some final lots also were rated for odor and flavor after cooking. For cooking tests, the meats were drained slightly, washed under fresh water, and then steamed for 20 minutes. The average time required for complete spoilage of the clams was determined from appearance and odor. Bacterial counts and pH were determined at intervals, on the storage solution in some cases and on the meats in others. In order to obtain representative samples for the bacteriological examination and the pH determinations, the meats were homogenized in a sterile Waring blendor. All bacterial counts were made on nutrient agar after 3 to 5 days incubation at 30° C. In several cases, particularly the experiments with sodium benzoate, the presence of a considerable number of pin-point colonies prevented accurate counting. Attempts were made to correlate bacterial counts and pH with keeping quality; however, considerable data on the change of pH of the storage solutions and bacterial counts have been omitted since no relationship was found.

Butter Clam

EFFECT OF pH OF STORAGE SOLUTIONS: Series A of Table 1 shows the effect of using 2 percent phosphate buffers as storage solutions at pH values of 4.5, 5.0,

Table 1 - Storage Life of Fresh Shucked Clams in Two Percent Buffer Solution
(In Glass Containers Packed in Crushed Ice)

Test Series	Storage solution[1]		Average storage life	Average time elapsed before complete spoilage
		pH	Days	Days
A	Phosphate buffer	4.5	8-9	over 12
	" "	5.0	8-9	over 12
	" "	5.5	8-9	over 12
	" "	6.0	5	8
	" "	6.5	5	8
	" "	7.0	4-5	6
	Tap water	-	2-3	6
	2% salt solution	-	2-3	5-6
	Clam nectar	-	2-3	5-6
B	Phosphate buffer	5.25	5-6	10
	Citrate buffer[2]	5.25	5-6	over 17
	Raw sea water, 3% salinity	-	2	4
C	Citrate buffer[2]	5.25	10	15
	Raw sea water, 3% salinity	-	3	7
D	Citrate buffer[2]	5.25	9	20
	Raw sea water, 3% salinity	-	2	5

1/ 100 grams clams per 100 cc. storage solution.
2/ The meats were found to be slightly bleached.
NOTE: Storage life is defined as limit of edibility (judged from appearance, odor, & taste).

5.5, 6.0, 6.5, and 7.0. Samples stored in fresh water, clam nectar, and 2 percent brine were used as controls. Storage in the phosphate buffer solution at pH 5.5 was effective in increasing the keeping quality of fresh clams 6 to 7 days over that of the controls. A solution of pH less than 5.0 tended to discolor the meats and to precipitate the protein; while at pH values above 6.0 the buffers had little perservative value. The pH of unbuffered samples decreased with storage time. In the cases of the buffered samples, the pH changes were quite irregular, and since no correlation was found, these data were omitted. In similar tests, 2 percent citrate buffer[1] at pH 5.25 (Series B, C, and D of Table 1) seemed to bleach the meats slightly and was as effective as phosphate buffer. Bacterial counts were omitted, since they were quite irregular and showed little correlation with organoleptic determinations of spoilage.

EFFECT OF CHEMICAL PRESERVATIVES: Chlorine compounds have been used in fish plants for disinfecting utensils and apparatus and for purifying water supplies. In Table 2 is shown the effect on clam meats of disinfecting the sea water prior

Table 2 - Storage Life of Fresh Shucked Clams in Water Treated with Chlorine Compounds (In Glass Containers Packed in Crushed Ice)

Test Series	Storage solution[1]	Preliminary treatment of clams	Average storage life	Average time elapsed before complete spoilage
			Days	Days
A,B,C	Raw sea water, 3% salinity	None	2	5
	Chlorinated sea water[2]	"	2	5
	Raw sea water, 3% salinity	Dipped in 10 times their weight of sodium hypochlorite solution containing 500 ppm. free chlorine for 15 seconds, and then drained.	2	4
	Raw sea water, 3% salinity	Dipped in 10 times their weight of "Nipicide" solution containing 500 ppm. available chlorine for 15 seconds, then drained.	2	5

1/100 grams clams per 100 cc. storage solution.
2/Raw sea water, 3% salinity, treated with sodium hypochlorite to concentration of 5 ppm. available chlorine and allowed to stand approximately 10 hours, after which time 1 ppm. available chlorine remained in the solution.
NOTE: Storage life is defined as limit of edibility (judged from appearance, odor, & taste).

to use as storage solution. Fresh sea water was collected and treated with sodium hypochlorite to 5 p.p.m. available chlorine. The solution was allowed to stand approximately 10 hours, after which time there remained approximately 1 p.p.m. of available chlorine. It was found that clams stored in sea water treated in this manner did not have a longer storage life than those stored in untreated water.

Table 2 also lists the results obtained by using chlorine solutions as dips, and shows the comparison of the action of sodium hypochlorite and an organic chlorine compound in the dip. Such organic chlorine compounds may be more stable than inorganic hypochlorites and, consequently, be effective over a greater length of time. There are a number of these compounds which have been suggested for use

1/Clark, W. M. (1928). p. 214.

with food. For these particular experiments, the commercial product known as "Nipicide" was employed. In each case, clams were dipped for 15 seconds in 10 times their weight of test solution, containing an equivalent of 500 p.p.m. available chlorine,[1] drained slightly, and placed in covered jars containing brine. Neither treatment proved to be of any value in enhancing the keeping quality of fresh clams.

Preliminary experiments indicated that sodium benzoate, although not consistently retarding bacterial growth, did have a marked action in augmenting keeping quality. Benzoate was applied in two ways: Directly to the solution in which the clams were stored, and dissolved in a dip used prior to storage of the meats in other solutions.

Series A and B of Table 3 shows the effect of adding 0.1 percent sodium benzoate directly to the storage solutions. Benzoate extended the storage life 5 to

Table 3 - Storage Life of Fresh Shucked Clams in Sodium Benzoate Solution
(In Glass Containers Packed in Crushed Ice)

Test Series	Storage solution[1]	Ratio of clams to storage solution[2]	Total sodium benzoate[3]	Average storage life	Average time elapsed before complete spoilage
			Percent	Days	Days
A	Raw sea water, 3% salinity	1:1	0	2	5
	0.1% sodium benzoate in raw sea water, 3% salinity	1:1	0.05	7	10
	0.1% sodium benzoate in citrate buffer	1:1	0.05	10	over 20
B	Raw sea water, 3% salinity	1:1	0.00	2	4
	0.1% sodium benzoate in raw sea water, 3% salinity	1:1	0.05	7-8	10-11
	Phosphate buffer	1:1	0.00	5-6	10
	0.1% sodium benzoate in phosphate buffer	1:1	0.05	10-11	over 17
	Citrate buffer	1:1	0.00	5-6	over 17
	0.1% sodium benzoate in citrate buffer	1:1	0.05	9-10	over 17
C[4]	0.50% sodium benzoate in citrate buffer	3:1	0.12	22-23	over 26
	0.40% sodium benzoate in citrate buffer	3:1	0.10	22-23	over 26
	0.30% sodium benzoate in citrate buffer	3:1	0.074	20-21	over 26
	0.20% sodium benzoate in citrate buffer	3:1	0.05	17-18	21-22
	0.10% sodium benzoate in citrate buffer	3:1	0.025	17-18	25
	0.05% sodium benzoate in citrate buffer	3:1	0.012	15-16	23
	0.10% sodium benzoate in citrate buffer	1:1	0.05	17	over 26
	Citrate buffer	1:1	0	13	over 26
	0.10% sodium benzoate in raw sea water, 3% salinity	3:1	0.025	17	over 26
	0.50% sodium benzoate in raw sea water, 3% salinity	1:1	0.12	22-23	over 26
	0.10% sodium benzoate in raw sea water, 3% salinity	1:1	0.05	17-18	over 26

1/All buffer solutions were of 2% concentration and at pH 5.25.
2/Ratio of 1:1 refers to 100 grams of clams per 100 cc. storage solution, etc.
3/Total percent sodium benzoate as calculated from total weight of clams and storage solution.
4/Mud clams only used in this series.
NOTE: Storage life is defined as limit of edibility (judged from appearance, odor, & taste).

1/Determined by arsenious oxide titration method. A.O.A.C. Ed. 5, p. 73, 1940.

9 days. Buffers containing added benzoate tended to increase the keeping time about 3 days longer than brine containing benzoate. This increased effectiveness of sodium benzoate in media of lower pH is similar to its action in the preservation of other foodstuffs.

Series C of Table 3 shows the effect of using smaller proportions of the citrate buffer solution and the effect of varying the concentration of sodium benzoate. The meats were placed in jars, and only enough storage solution was added to cover the meats. The highest concentration of benzoate used was a 0.5 percent solution, or a total of 0.12 percent, as calculated from the total weight of clams and storage solution.

Buffer solutions containing 0.1 to 0.13 percent sodium benzoate (total concentration of 0.05 percent), as well as sea water containing 0.1 percent sodium benzoate (total 0.025 percent), showed considerable protective action during 17 to 20 days' storage time, but higher concentrations of benzoate in the citrate buffer solution produced a slightly pungent odor (not a spoilage odor) which, however, was not evident after cooking. Only soft clams were used in this series, therefore, it is possible that the general increase in keeping quality was really a species characteristic.

A dip of sodium benzoate was quite effective also in prolonging the storage life of fresh clams (Table 4, p. 10). Individual samples of clams in this series were dipped for 30 minutes in one of the following solutions:

5 percent sodium benzoate in fresh water.

2.5 percent sodium benzoate in 2.5 percent brine.

1 percent sodium benzoate in 4 percent brine.

0.1 percent sodium benzoate in 4.9 percent brine.

The meats were drained and stored in sea water, benzoated brine, or a buffer solution.

In the second group of tests in Series A of Table 4, quintuplicate clam samples were dipped in the 1 percent sodium benzoate in 4 percent brine solution and then stored in sterilized sea water. Other samples of clams were dipped in the various benzoate solutions and stored in citrate buffer as a comparison. In addition, undipped samples, to serve as controls, were stored in sea water, citrate buffer, and 0.1 percent sodium benzoate in 3.5 percent brine. The sea water used in the experiments of Series A, Table 4, was first sterilized in an autoclave to eliminate any errors due to unnecessary contamination by extraneous bacteria.

Bacterial counts of both the dipped and undipped control samples stored in sterile sea water remained consistently low, while undipped samples stored in citrate buffer gave high counts after 2 and 7 days, although in organoleptic tests, the meats were judged as still being in good condition. The counts in the latter samples increased further with additional storage time. In the case of the clams dipped in benzoate brine and stored in the buffer solution, there was an actual decrease in bacterial count for a certain time, after which the counts again increased. Fellers and Harvey (1940), in their experiments with fillets, found that the protective action of benzoates appeared greater when odor and taste were used as criteria of spoilage rather than the number of bacteria. Tarr and Sunderland (1938) observed that benzoic acid suppressed trimethylamine formation without affecting the bacterial population of fish and concluded that either certain species of bacteria are inhibited or that the preservative alters the metabolism of the organisms.

The counts of the dipped samples stored in citrate solution remained consistently lower than those of the untreated samples, even at the point of inedibility. This seems to indicate that aerobic counts may be used for following the relative course of spoilage in a buffered sample, but that they are not an absolute criterion of the degree of spoilage at any given time. The pH of the meats decreased slightly as storage continued, although the changes were not great enough or consistent enough to be considered an accurate means of indicating the degree of spoilage.

Table 4 - Storage Life of Fresh Shucked Clams Dipped in Sodium Benzoate (In Glass Containers Packed in Crushed Ice)

Test Series	Storage solution 1/	Preliminary treatment of clams 2/	Storage time	Bacteria per gram clams	pH of clams	Average storage life	Average time elapsed before complete spoilage
			Days	Number		Days	Days
A	Autoclaved, raw sea water, 3% salinity	None (Control)	2	580	6.10		
			4	450	6.09		
			7	380	5.84	3	7
			9	440	5.81		
			11	300	5.88		
	Autoclaved, raw sea water, 3% salinity	1% sodium benzoate in 4% brine	2	190	6.09		
			7	360	5.93		
			11	300	5.89	9	16-17
			14	330	5.88		
			21	450	5.90		
	Citrate buffer	None (Control)	2	1.23×10^6	5.66		
			7	1.5×10^6	5.68		
			11	1.95×10^6	5.65	10	15
			14	22.8×10^6	5.67		
			21	13.6×10^6	5.64		
	Citrate buffer	1% sodium benzoate in 4% brine	2	720,000	5.70		
			7	440,000	5.68		
			11	420,000	5.70	10	21
			14	780,000	5.71		
			21	2.5×10^6	5.74		
B	Citrate buffer	5% sodium benzoate	7	1,130	-	14-15	over 20
			16	85,000	-		
	Citrate buffer	2.5% sodium benzoate in 2.5% brine	7	920	-	14-15	over 20
			16	1.34×10^6	-	14-15	over 20
	Citrate buffer	1% sodium benzoate in 4% brine	7	2,370	-		
			16	3.45×10^6	-	14-15	over 20
	Citrate buffer	0.1% sodium benzoate in 4.9% brine	7	3,150	-		
			16	150,000	-	9	18-19
	Citrate buffer	None (Control)	7	41,000	-		
			16	1.0×10^6	-	9	20
	Autoclaved, raw sea water, 3% salinity	" (")	7	2.13×10^6	-		
			16	-	-	2	5
	0.1% sodium benzoate in 3.5% brine	None	7	1.05×10^6	-	12-13	20
			16	45×10^6	-		

1/ 100 grams of clams to 100 cc. storage solution. All buffer solutions were of 2% concentration and pH 5.25.

2/ Clams were dipped in four times their weight of solution for 30 minutes.

NOTE: Storage life is defined as limit of edibility (judged from appearance, odor, & taste).

The protective action of sodium benzoate was, in general, fairly effective. The dipped samples remained in good condition in brine for about 9 or 10 days, which was approximately 6 or 7 days longer than the untreated samples. As was previously shown, storage of fresh clams in citrate buffer solutions seemed to augment the keeping quality. In this series, preliminary treatment with sodium benzoate and storage in buffer solutions was even more effective. The untreated

samples stored in citrate solution showed a storage life of 9 days. On the other hand, the benzoate-dipped samples stored in the same solution had a storage life of approximately 14 to 15 days.

The clams stored in 0.1 percent sodium benzoate in 3.5 percent brine had a keeping time of 12 to 13 days, while those stored in citrate buffer kept for only 9 days. Dipping the clams in a benzoate-salt mixture followed by storage in citrate buffer seemed to be the most effective treatment, inasmuch as samples so treated had a keeping time of approximately 14 to 15 days. The untreated samples stored in brine were not edible after 2 days. The spoilage rates of the clams were the same whether they were stored in raw or autoclaved sea water.

Chemical analysis (Association of Official Agricultural Chemists, 1940) of clams dipped 30 minutes in 1 percent sodium benzoate in 4 percent brine and stored over-night in 2 percent brine (100 grams clams--with 100 ml. brine) showed an average of 0.051 percent sodium benzoate absorbed by the meats and an average of 0.05 percent sodium benzoate remaining in the storage solution. Clams stored overnight in 0.1 percent sodium benzoate in 2 percent brine (100 grams clams and 100 cc. benzoate brine) were found to have absorbed an average of 0.050 percent sodium benzoate.

Samples of the clams stored for several days in buffer solutions, or in 0.1 percent sodium benzoate brine, and of those dipped in 1 percent sodium benzoate dissolved in 4 percent salt solution with storage in buffer and brine, were cooked for organoleptic tests. Comparisons were made with fresh untreated clams. For cooking tests, clams were first drained of their storage solution, washed slightly with fresh water, and finally steamed for 20 minutes. The treated samples compared favorably with the controls, and the taste panel observed no off-flavor or odor due to treatment with sodium benzoate or buffer solutions.

Conclusions

1. Storage in 2 percent phosphate or citrate buffer solutions tended to enhance slightly the keeping quality of fresh-shucked clams.

2. Dipping in hypochlorite or "Nipicide" prior to storage appeared to be of no value.

3. The use of sodium benzoate enhanced the keeping quality of fresh-shucked clams, and both dipping and storing in benzoate-brine solutions were found to be effective.

4. Samples treated with benzoate-brine and subsequently stored in citrate or phosphate buffer solutions at pH of 5.2-5.3 were found to have a storage life slightly longer than samples treated in the same manner but stored in 2 percent brine.

5. Clams that were dipped or stored in dilute sodium benzoate-brine were found to contain considerably less sodium benzoate than the 0.1 percent permitted in several other food products.

6. Sodium benzoate, in either the dipping or storage solutions, did not alter the flavor or palatability of fresh-shucked clams.

7. The use of sodium benzoate, together with buffer solutions, increases keeping quality sufficiently to permit shipment of fresh-shucked clams from Southeastern Alaska to consuming markets in the Pacific Northwest.

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VITAMIN A AND D IN FISH LIVERS AND VISCERA

By Charles Butler*

During the past five or six years, interest in vitamin-bearing raw materials has become more wide-spread due to the mushroom growth of vitamin oil production. Many new, or hitherto unidentified, species of livers, especially those from the shark group, have become commercially important. The need for a tabulation of data on vitamin A and D in fish livers and viscera has often been apparent. Tables 1, 2, and 3 of this report have been prepared, therefore, to serve as a ready reference to pertinent data that are available on several of the factors influencing the value of fish livers and viscera.

Table 1 includes the data for those fish that contribute the major portion of the raw materials for the vitamin A industry of the United States and Canada. The order of the listing in this table is based on the approximate importance of the species in the vitamin A production for 1944. Since that time, some changes have undoubtedly occurred. For example, the landings of soupfin shark livers at Seattle have declined very substantially, and very probably, livers from other species such as the grayfish (dogfish) have fallen off to a lesser degree. Nevertheless, in general, the same order of importance holds for the several species reported.

In Table 2, all the vitamin A data for the other miscellaneous species is grouped according to area of capture.

The vitamin D potency ranges for miscellaneous fish livers and viscera are presented in Table 3. The grouping is again by area of capture.

In each of these three tabulations the basic data have been collected from all available sources and converted, as nearly as possible, to a comparable unit basis. Wherever a sufficient number of analyses were available, an evaluation of the oil content and vitamin content data was made in the determination of the ranges for these values as used in the tables.

Any attempt to acknowledge all the contributions of data from individuals, companies, or institutions that were considered in making up these tables would result in a list of references considerably longer than the compilations themselves. Several major sources of valuable information were:

1. The published reports of the fisheries research laboratories of Canada, South Africa, and Australia, and of the International Halibut Commission.

2. Published and unpublished data collected over a number of years at the Seattle Technological Laboratory of the Fish and Wildlife Service in connection with the vitamin A investigation.

3. Numerous reports in the scientific literature of investigations on new or slightly utilized species by individuals and organizations.

In a compilation of this type it is difficult to assign an accurate single value for many of the individual items, such as the oil content or the vitamin A content, because of the extreme variations encountered in fish. These variations may be due, in part, to one or all of the following: Sex, maturity, stage in the season or migration, food supply, etc. Exceptional analyses, such as that of a halibut liver oil assaying over 1,000,000 units of vitamin A per gram, or a grayfish (dogfish) liver assaying 100,000 units, have not been considered in arriving at the ranges used in these tables. Where only one value is listed, that is the only information available for the particular species, and it usually represents the result from a single analysis or from a limited number of analyses.

Tables 1, 2, and 3 appear on the following pages.

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Table 1 - Vitamin A Content of Oils from Fishery Sources having Commercial Importance in the United States & Alaska[1]

Common name	Scientific name	Area in which fish are caught	Source of oil	Percent of round weight [2]	Oil content, percent	Vitamin A content in U. S. Pharmacopoeia units per gram of oil	
						Range	Average
Soupfin shark	Galeorhinus zyopterus	Pacific (male)	liver	10	55-68	45,000- 200,000	120,000
" "	" "	" (female)	"	10	65-72	15,000- 40,000	32,000
Grayfish (dogfish)	Squalus suckleyi	" -Alaska	"	10	67-72	2,000- 20,000	5,000
" "	" "	" -Hecate Strait	"	10	65-70	7,000- 15,000	10,000
" "	" "	" -Wash.-Ore.	"	10	50-70	8,000- 25,000	14,000
" "	" "	" -N. Calif.	"	10	62-68	12,000- 20,000	15,000
Halibut	Hippoglossus hippoglossus	Pacific-Area 3[3]	liver	1.5-3	8-21	40,000- 160,000	87,000
"	" "	" - " 2[4]	"	1 -1.75	17-27	20,000- 65,000	40,000
"	" "	"	viscera[5]	2.5-5	2-5	70,000- 700,000	200,000
Sablefish	Anoplopoma fimbria	Pacific	liver	2 -2.5	10-26	50,000- 190,000	90,000
"	" "	"	viscera	3 -4	5-12	90,000- 250,000	125,000
Lingcod	Ophiodon elongatus	Pacific	liver	1 -1.5	8-20	40,000- 550,000	175,000
"	" "	"	viscera	1.8-3	4-15	10,000- 175,000	40,000
Sleeper shark	Somniosus microcephalus	Pacific	liver	10 -15	40-55	5,000- 15,000	7,000
Mud shark	Hexanchus griseus	"	"	10 -15	60-65	5,000- 7,000	5,500
Great blue shark	Priomace glauca	"	"	[6]	30-45	7,000- 27,000	20,000
Hammerhead shark	Sphyrna zygaena	" -Atlantic	"	[6]	30-40	30,000- 120,000	50,000
" "	" diplana	"	"	[6]	55-75	20,000- 150,000	60,000
" "	" "	Atlantic	"	[6]	[6]	5,000- 140,000	40,000
" "	" tudes	Florida	"	[6]	[6]	10,000- 125,000	50,000
Little black tip	Isogomphodon maculipinnis	Florida	"	[6]	40-60	5,000- 25,000	5,000
Tiger shark	Galeocerdo arcticus	"	"	[6]	45-60	2,000- 5,000	3,000
Sand-bar shark	Carcharinus milberti	"	"	[6]	[6]	3,000- 15,000	8,000
Nurse shark	Giglymostoma cirratum	"	"	[6]	[6]	1,000- 10,000	3,000
Dusky shark	Carcharinus obscurus	"	"	[6]	[6]	5,000- 60,000	25,000
Leopard shark	Triakis semifasciatum	Pacific	"	[6]	40-50	1,000- 5,000	3,000
Bay shark	Carcharias lamiella	"	"	[6]	60-75	2,000- 20,000	10,000
Thresher shark	Alopias vulpas	"	"	[6]	45-55	1,000- 5,000	3,000
Mexican shark	Eulamia lamiella	"	"	[6]	40-50	20,000- 80,000	40,000
Gray smooth hound	Mustelatus californicus	"	"	[6]	50-60	10,000- 25,000	20,000
Cazon shark	Unknown	Argentina-Brazil	"	7 -10	30-45	10,000- 200,000	50,000
Albacore tuna	Germo alalunga	Pacific	"	1.5-2	7-20	10,000- 60,000	25,000
Bluefin tuna	Thunnus thynnus	"	"	[6]	4- 6	25,000- 100,000	75,000
Yellowfin tuna	Neothunnus macropterus	"	"	[6]	3- 5	35,000- 90,000	50,000
Skipjack tuna	Euthynnus pelayms	"	"	[6]	4- 6	30,000- 60,000	40,000
Bonito	Sarda chiliensis	"	"	[6]	4-12	15,000- 60,000	35,000
Swordfish	Xyphias gladius	Pacific-Atlantic	"	1.4-2.6	8-35	20,000- 400,000	250,000
"	" "	" "	viscera	3 -6	6-12	2,000- 30,000	10,000
Black sea bass	Stereolepis gigas	Pacific	liver	[6]	13-20	100,000-1,000,000	300,000

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(Continued on the following page)

Table 1 - Vitamin A Content of Oils from Fishery Sources having Commercial Importance in the United States & Alaska[1/] (Cont.)

Common name	Scientific name	Area in which fish are caught	Source of oil	Percent of round weight[2/]	Oil content, percent	Vitamin A content in U. S. Pharmacopoeia units per gram of oil	
						Range	Average
Totuava	Cynoscion nobilis	Pacific	liver	[6/]	15-25	40,000-400,000	[6/]
Cod	Gadus callarias	Atlantic	"	3 -5	20-60	1,000- 6,000	2,000
Rosefish	Sebastes marinus	"	waste[7/]	[6/]	2-4	3,000- 5,000	[6/]
Halibut	Hippoglossus hippoglossus	"	liver	1.5-2.5	15-25	40,000	[6/]
Rockfish	Sebastodes	Pacific	"	1 -1.5	5-25	14,000-300,000	[6/]
"	"	"	viscera	1.5-2.5	2-15	15,000-125,000	[6/]
Petrale sole	Eopsetta jordani	Pacific	liver	1 -1.5	6-25	4,000-175,000	[6/]
Herring	Clupea pallasii	"	body	[6/]	5-25	50- 300	90
Pilchard	Sardina caerulea	"	"	[6/]	5-25	50- 800	100
Menhaden	Brevoortia tyrannus	Atlantic	"	[6/]	5-20	500	[6/]

1/ These data compiled from reports of research at the laboratories of the Fish and Wildlife Service and of the Fisheries Research Board of Canada, and from articles published by representatives of commercial processors of fish livers and viscera. For the most part, the data are based on large lots of material or on samples taken over the normal season for the species. Vitamin D data for some of these species are included in Table 3.

2/ Percent of round weight means the proportion of liver weight to the weight of the entire fish (undressed) expressed as percent.

3/ Area 3 is defined by the International Halibut Commission regulations as follows: "Area 3 shall include all the convention waters off the coast of Alaska that are between Area 2 and a straight line running south from the southwestern extremity of Cape Sagak on Umnak Island, at a point approximately latitude 52° 49' 30" N., longitude 169° 07' 00" W., according to Chart 8802, published January, 1942, by the United States Coast and Geodetic Survey, and that are south of the Alaska Peninsula and of the Aleutian Islands and shall also include the intervening straits or passes of the Aleutian Islands."

4/ Area 2 includes: "all convention waters off the coasts of the United States of America and of Alaska and of the Dominion of Canada between Area 1B and a line running through the most westerly point of Glacier Bay, Alaska, to Cape Spencer Light as shown on Chart 8304, published in June, 1940, by the United States Coast and Geodetic Survey, which light is approximately latitude 58° 11' 57" N., longitude 136° 38' 18" W., thence south one-quarter east and is exclusive of the areas closed to all halibut fishing in Section 9 of these regulations."

5/ Viscera, unless otherwise designated, means the contents of the body cavity minus the liver, stomach, and gonads.

6/ The source from which information listed here was obtained did not supply data under this heading.

7/ Waste is the entire body of the rosefish minus the fillet or edible portion. It includes head, backbone, skin, and viscera.

Table 2 - Vitamin A Content of Oils from Fishery Sources having Little or No Present Commercial Importance in the U.S. & Alaska[1]

Common name	Scientific name	Area in which fish are caught	Source of oil	Percent of round weight[2]	Oil content, percent	Vitamin A content in U. S. Pharmacopoeia units per gram of oil
Basking shark	Cetorhinus maximus	Pacific	liver	3/	60-70	300
Spotted cow shark	Notorynchus maculatus	"	"	6	29	1,400
Cod	Gadus macrocephalus	"	"	1.5-4	25-45	5,000- 17,000
"	" "	"	viscera[4]	3.2-3.6	1.4-2.6	36,000-112,000
Cabrilla	Epinephelus analogus	"	liver	3/	13	164,000
Cormuda	Unknown	"	"	3/	50	30,000
Pejerala	"	"	"	3/	27	98,000
Yellowtail	Seriola dorsalis	"	"	3/	5-7	20,000- 40,000
Arrow-tooth halibut	Atheresthes stomias	"	"	3/	10-15	10,000- 80,000
English sole	Parophrys vetulus	"	"	1 -1.5	5-10	5,000
Starry flounder	Platichthys stellatus	"	"	1.5-2	10-15	1,000- 25,000
King salmon	Oncorhynchus tschawytscha	"	"	3/	4-8	10,000- 40,000
" "	" "	"	offal[5]	30	10-15	1,500- 2,000
Sockeye "	" nerka	"	liver	1.5-2	5-8	10,000- 50,000
" "	" "	"	offal	33	10-20	500- 5,000
Silver "	" kisutch	"	liver	1.5-2.5	4-6	10,000- 30,000
" "	" "	"	offal	33	10-15	500- 3,000
Pink "	" gorbuscha	"	liver	3/	4-6	1,000- 40,000
" "	" "	"	offal	35	10-12	500- 3,000
Chum "	" keta	"	liver	1.5-2.5	2-6	5,000- 15,000
" "	" "	"	offal	33	5-10	none
Steelhead	Salmo gairdneri	"	liver	3/	10-20	10,000- 20,000
Skate	Raja binoculata	"	"	3/	30-60	500- 3,000
Starry skate	" stellulata	"	"	3/	10-30	4,000- 30,000
Ratfish	Hydrolagus colliei	"	"	3/	70-85	100- 1,000
Finback whale	Balaenoptera velefera	"	"	3/	0.8	40,000
Spera whale	Physeter macrocephalus	"	"	3/	1.0	440,000
Beluga "	Delphinapterus leucas	"	"	3/	0.3	10,000
Stockfish	Merlucius capensis (Castel.)	South Africa	"	2.5-4	28-50	6,000- 28,000
"	" " "	" "	viscera	0.7-1.0	2.5-3.5	80,000-650,000
Kingklip	Genypterus capensis (Smith)	" "	liver	1.3-3.3	25-45	7,000- 52,000
"	" " "	" "	viscera	2.0	1-2	10,000- 32,000
Kabeljou	Sciaena hololepidota (Lacep.)	" "	liver	3/	25	85,000
Stone-bass	Polyprion americanus (Bl. & Schn.)	" "	"	1.6	10-20	75,000-700,000
Blue shark	Unknown	" "	"	3/	3/	15,000- 30,000
Dogfish	"	" "	"	3/	3/	4,000- 6,000
John Dory	Zeus capensis (C. & V.)	" "	"	4 -5	13-37	8,000- 44,000
" "	" " "	" "	viscera	3 -3.5	1-5	20,000-100,000

(Continued on the following page)

Table 2 - Vitamin A Content of Oils from Fishery Sources having Little or No Present Commercial Importance in the U.S. & Alaska[1/] (Continued)

Common name	Scientific name	Area in which fish are caught	Source of oil	Percent of round weight[2/]	Oil content, percent	Vitamin A content in U. S. Pharmacopoeia units per gram of oil
Halibut	Unknown	South Africa	liver	3/	3/	50,000
Cod	"	" "	"	3/	3/	1,000
Snoek	Thyrsites atun (Euphrasen)	" "	"	1.5	16.5	14,000-560,000
"	" " "	" "	viscera	1.6	11.7	20,000-160,000
Horse mackerel	Trachurus trachurus, Lin.	" "	liver	1.25-2.75	5-15	80,000-600,000
" "	" " "	" "	viscera	1.25-3	2-15	20,000-130,000
Bonito	Isurus glaucus	Florida	liver	3/	40-50	500- 1,500
Mackerel shark	Carcharinus platyodon	"	"	3/	3/	2,000- 4,500
Black-nose shark	" scronotus	"	"	3/	3/	1,200
No-name shark	" falciformis	"	"	3/	3/	6,600
Silky shark	" floridanus	"	"	3/	3/	2,000- 5,000
Bonnet-head	Sphyrna tiburo	"	"	3/	3/	900
Great white shark	Carcharodon carcharias	"	"	3/	3/	700- 7,000
Spotted eagle ray	Stoasodon narinari	"	"	3/	3/	35
Cow-nosed ray	Rhinoptera bonasus	"	"	3/	3/	675
Manta	Manta birostris	"	"	3/	3/	200- 400
Sawfish	Pristis pectinatus	"	"	3/	3/	900- 7,000
Congrio negro	Genyoterus chilensus	Chile	"	3/	3/	1,000- 2,000
Cow shark	Unknown	"	"	3/	54-70	1,600- 3,000
Raya	"	"	"	3/	30	13,000
Barn-door skate	"	"	"	3/	52	4,000
Tollo	Galeorhinus mento	"	"	3/	20-53	1,200- 87,000
Peje-gallo	Callorhynchus callorhynchus	"	"	3/	28-41	700- 1,600
Pinta roja	Unknown	"	"	3/	7-41	1,300- 4,600
Spiny dogfish	"	"	"	3/	41-46	6,000- 14,000
Six-gill shark	"	"	"	3/	85	1,500
Bacalao	Polyprion oxigensis	"	"	3/	0.3-5.4	16,000-425,000
Sierra	Thysitops lepidopoides	"	"	3/	0.8	208,000
Unknown shark	Galeorhinus	"	"	3/	57	49,000
Merluza	Unknown	"	"	3/	25-37	3,000- 4,000
Hammerhead shark	Sphyrna zygaena	Brazil	"	3/	3/	175,000-200,000
Unknown	Carcharias limbatus	"	"	3/	3/	50,000-125,000
"	" lamia	"	"	3/	3/	50,000
"	Odontaspis americanus	"	"	3/	3/	10,000- 50,000
"	Isurus oxyrhynchus	"	"	3/	3/	25,000
"	Rhinoptera jussieuri	"	"	3/	3/	3,000- 5,000
"	Galeocerdo maculatus	"	"	3/	3/	1,000- 3,000
"	Manta chrenbergii	"	"	3/	3/	3,000- 5,000

(Continued on the following page)

Table 2 - Vitamin A Content of Oils from Fishery Sources having Little or No Present Commercial Importance in the U.S. & Alaska[1/] (Continued)

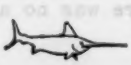
Common name	Scientific name	Area in which fish are caught	Source of oil	Percent of round weight[2/]	Oil content, percent	Vitamin A content in U. S. Pharmacopoeia units per gram of oil
Sardinero	Eulamia aethalorus	Pacific-Mexico	liver	3/	66-78	3,000- 16,000
Gambruso	" azureus	" "	"	3/	68	17,500
Pilota	" galapagensis	" "	"	3/	32-55	8,000-110,000
Puro	" velox	" "	"	3/	69-79	20,000- 30,000
"	Scoliodon longurio	" "	"	3/	68	50,000
Unknown shark	Unknown	India	"	3/	50-70	8,000- 12,000
Sawfish	Pristis pectinatus	"	"	3/	3/	12,000
Unknown	Scoliodon palasorrah	Philippines	"	3/	5	2,000
Sawfish	Pristis microdon, Lothan	"	"	3/	8	300
Sanga	Mobula enegeodoo-tenke	"	"	3/	3/	2,400
Unknown	Mustelus canis, Mitch.	Uruguay	"	3/	3/	50,000- 60,000
"	Micropogon ondulatus	"	"	3/	3/	20,000- 50,000
Corvina	Unknown	"	"	3/	3/	20,000
Pescadilla	Cynoscian	"	"	3/	3/	25,000
Dogfish	Squalus acanthias	Atlantic	"	3/	40-60	1,000- 7,000
Yellowtail	Seriola dorsalis	Australia	"	3/	3/	42,000
Congrio colorado	Genypterus blacodes	"	"	3/	3/	1,000- 2,000
Ling	" "	New Zealand	"	3/	35	16,000- 24,000

1/ Vitamin D data for some of these species are included in Table 3.
2/ Percent of round weight means the proportion of liver weight to the weight of the entire fish (undressed) expressed as percent.
3/ The source from which information listed here was obtained did not supply data under this heading.
4/ Viscera indicates the contents of the body cavity minus stomach, liver, and gonads.
5/ Offal indicates cannery trimmings, including head and viscera.

Table 3 - Vitamin D Content of Oils from Fishery Sources

Common name	Scientific name	Area in which fish are caught	Source of oil	Vitamin D content in International units per gram of oil
Albacore tuna	Germo alalunga	Pacific	liver	25,000-250,000
Bluefin "	Thunnus thynnus	"	"	20,000- 70,000
Yellowfin "	Neothunnus macropterus	"	"	10,000- 45,000
Skipjack "	Euthynnus pelayms	"	"	25,000-250,000
Bonito	Sarda chiliensis	"	"	50,000
Swordfish	Xyphias gladius	" -Atlantic	"	2,000- 25,000
Mackerel, Pacific	Scomber diego	Pacific	"	1,400
Albacore tuna	Germo alalunga	"	waste 2/	67
Halibut	Hippoglossus hippoglossus	"	liver	1,000- 5,000
"	" "	"	viscera 3/	100- 500
Sablefish	Anaplopoma fimbria	"	liver	600- 1,000
"	" "	"	viscera	100
Lingcod	Ophiodon elongatus	"	liver	1,000- 6,000
"	" "	"	viscera	100- 200
Rockfish	Sebastodes sp.	"	liver	300- 5,000
Cod	Gadus macrocephalus	"	"	85- 500
Ishinagi	Stereolepis	"	"	3,800
Barracuda	Sphyraena argentes	"	"	2,000
Black sea bass	Stereolepis gigas	"	"	5,000
Beluga whale	Delphinapterus leucas	"	"	50- 100
Grayfish (Dogfish)	Squalus suckleyi	"	"	5- 25
" "	" "	"	body 4/	29
Ratfish	Hydrolagus colliei	"	liver	2- 5
Soupfin shark	Galeorhinus zyopterus	"	"	5- 25
Herring	Clupea pallasii	"	body 5/	25- 160
"	" "	"	liver	250
Pilchard	Sardina caerulea	"	body 5/	20- 100
King salmon	Oncorhynchus tschawytscha	"	liver	100- 500
" "	" "	"	offal 6/	50- 150
Sockeye "	" nerka	"	liver	200- 600
" "	" "	"	offal	100- 300
Silver "	" kisutch	"	liver	100- 500
" "	" "	"	offal	100- 200
Pink "	" gorbuscha	"	liver	100- 600
" "	" "	"	offal	100- 300
Chum "	" keta	"	liver	100- 500
" "	" "	"	offal	50- 100
Starry flounder	Platichthys stellatus	"	liver	1,000
Rex sole	Errex zachirus	"	"	150
Skate	Raja binoculata	"	"	25
Mud shark	Hexanchus griseus	"	"	20
Snoek	Thyrsites atun (Euphrasen)	South Africa	"	500- 6,000
"	" " (")	" "	viscera	85
Stonebass	Polyprion americanus (Bl. & Schn.)	" "	liver	700- 1,300
Stockfish	Merlucius capensis (Castel.)	" "	"	50- 380
"	" " (")	" "	viscera	3
Kingklip	Genypterus " (Smith)	" "	liver	85- 600
Halibut	Unknown	" "	"	1,000- 2,000
Cod	"	" "	"	100
Ling	Genypterus blacodes	New Zealand	"	500
Yellowtail	Seriola dorsalis	Australia	"	9,000- 17,000
Halibut	Hippoglossus hippoglossus	Atlantic	"	2,000
Mackerel, common	Scomber scombrus	"	"	750
Rosefish	Sebastes marinus	"	waste 7/	50
Dogfish	Squalus acanthias	"	liver	3

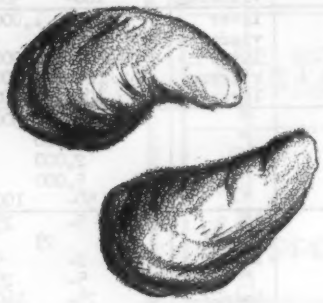
1/ Data on vitamin A content of most of these fish are to be found in Tables 1 and 2.
2/ Waste indicates offal from the cannery fish cleaning tables. The raw eviscerated fish is pre-cooked prior to this cleaning operation, hence some of the tuna body oil has been lost from this waste before it is made into meal and oil.
3/ Viscera indicates the contents of the body cavity minus the liver, stomach, and gonads.
4/ Body indicates the entire body of the fish minus the liver.
5/ Body indicates the entire body of the fish including the liver and viscera.
6/ Offal indicates the cannery trimmings, including heads, livers and viscera but not eggs.
7/ Waste indicates the entire body of the rosefish minus the fillet or edible portion. It includes head, backbone, skin, and viscera.



SECTIONAL REVIEWS

Chesapeake

OYSTERS: Mortality of oysters in a 100-square-mile section of upper Chesapeake Bay, ranging as high as 75 percent on certain bars in this area, has been disclosed by a joint survey, in which the Federal Government and the State of Maryland cooperated, the Fish and Wildlife Service reported on March 22.



The survey covered 44 major oyster bars in the upper part of Chesapeake Bay and was carried out by the Fish and Wildlife Service and the Maryland Departments of Tidewater Fisheries and of Research and Education.

Recent mortality on these bars, affecting both young and adult oysters, varied from 7 to 75 percent of all oysters present, and was found to be most severe in the northern part of the affected area, gradually decreasing toward the south.

Along the eastern shore, the affected grounds were found to extend from the uppermost bars, in the vicinity of Poole's Island, about 20 miles to the lower end of Kent Island, generally known as "Bloody Point." Along the western shore of the Chesapeake, oyster mortality was observed from the same uppermost limits of oyster growth as far south as Herring Bay. Oyster beds in the Bay proper are more seriously affected than those in the tributaries, it is reported.

Observations by State and Federal biologists disclosed that the salinity of the water in the upper Bay has been only one-half to one-third of normal during the past year and that this unfavorable condition is believed to be responsible for the heavy mortality of oysters in the upper part of the Bay. Daily records made at Solomons Islands show that, from July of last year to the present time, salinities have remained at the lowest level reached in the past nine years.

These unfavorable conditions, aggravated by heavy local rains last July and August, prevented the normal recovery of oysters after last summer's spawning season and also interfered with their feeding. As a result, oysters in these upper Bay areas were in poor condition last fall and were unable to withstand continued exposure to low salt concentrations.

Oysters in the vicinity of Poplar Island and in other places farther south apparently have not been injured and, judging from reports coming in from the Crisfield area, are in very good condition in the latter section.

State and Federal experts carefully explored the possibility that the present mortality might be caused by attacks of natural enemies of the oyster, by some organism associated with the oysters, or by a change in their environment other than lowered salinity. However, no evidence was found to support any of these possibilities.

Mortality was found to be equally heavy on natural oyster bars and on State planted beds, indicating that there was no association with planting and other oyster cultural operations.

Experts of the Fish and Wildlife Service state that the present mortality of oysters is not an unusual phenomenon, high death rates among the oysters of the upper Chesapeake having occurred repeatedly during the past 38 years--in 1908, 1916, 1928, 1936, and 1943. In each instance, high mortality coincided with an abnormally high run-off of the Susquehanna River and low salinity of the Bay water.

It was recognized that conditions might improve in the near future as a result of the increase in water salinity which occurred during March, at a season when the salinity normally drops. Unless the run-off of the river suddenly rises, normal conditions should soon be restored.

Middle Atlantic

NEW JERSEY: A recent canning and byproducts survey of the fishing industry of New Jersey indicated that landings of fresh fish were larger during February than is normal at this season, according to one of the Service's Fishery Marketing Specialists in the Middle Atlantic area. The increased landings of codfish by trawl line and otter trawl vessels were largely responsible for the increase in total production, although landings of ling and whiting by the otter trawl fleet were so large during February, that, on one or two instances, incoming vessels were compelled to wait as long as 12 or 14 hours until others were able to unload their catches. Some of this congestion, however, may be attributed to the small docks at certain points.

Preparations for the coming shad season have progressed favorably among pound-net and stake gill-net fishing firms. It is reported that about 65 or 70 stake gill-nets will be operated in Staten Island areas.

With the return of many skilled workmen from the Armed Services, the oyster shell industry is planning to reach nearly full time production by the end of the current season. However, their production may be curtailed after July or August, especially in Southern New Jersey, by the lack of shells, as the State plans to use most of the available shells in that area for planting purposes.

South Atlantic and Gulf

Within the period of three years, certain definite trends which are an outgrowth of wartime economy, have become noticeable in the fisheries of the South, according to one of the Service's Fishery Marketing Specialists in the South Atlantic and Gulf area.

Modern shrimp packing plants are being built in the Gulf area. Now electrical and mechanical hoisting rigs unload vessels in much less time than the old hand rigs; metal conveyors bring the shrimp from dock to peeling or heading rooms after they have been thoroughly washed; metal picking tables have been improved; heads and shell are removed by uniformed women; clean washrooms are available; and separate supply rooms are maintained. The latter are stocked with ample replacement parts for all plant and vessel machinery, eliminating the necessity of long delays in getting plant machinery or vessel engines back into running condition. As time is a contributing factor in modern packaging of seafood, this supply and repair room is recognized as an essential part of the packing plant. These plants are divided into sections and operate smoothly, without the confusion and filth of a one-room plant.

The fish dealers who formerly moved up and down the Atlantic Coast and into the Gulf area with the shrimp migrations are now establishing themselves in one locality. The use of larger and faster vessels with greater capacity and refrigeration facilities has been a big factor in influencing the itinerant shrimp dealer to choose a stabilized location.

Great advancement has been made in the field of frozen fishery products during the past three years. The freezing of shrimp has already become the established practice of a majority of dealers, and larger quantities of oysters are also being frozen by shippers.

Compared with the seasonal production average of former years, the current shrimp season in the Gulf has been disappointing. Weather conditions have not been normal, and the fleet has been restricted to ports or to short trips the greater part of the season. However, it has been reported that the fall shrimping season in North Carolina was the best ever experienced in that State.

Experiments are under way in the Gulf area with vessels equipped with refrigeration facilities. These vessels circulate among fishing and shrimping craft, taking their load, or supplying ice and minor repair parts and equipment, thus enabling the craft to remain on the fishing banks for a longer time.

The fishing industry of the South Atlantic and Gulf areas is anticipating a better than average season, insofar as labor and equipment are concerned. The labor supply is not yet normal, but dealers have learned valuable lessons in labor savings and more efficient methods of handling seafoods during the war.

Some new equipment is being installed in old plants, and a few new plants are being erected, but in most instances, old equipment is being modernized and kept in first-class operating condition.

Many of the Gulf fishing vessels are in excellent shape because there has been ample time to make repairs during the extended periods of adverse weather conditions.

TECHNOLOGICAL RESEARCH IN SERVICE LABORATORIES

Ketchikan, Alaska

Methods for determining vitamin B_1 and B_2 have been reviewed and work started on a method for riboflavin. Several modifications have been made to reduce the cloudiness in the final flourescing solution.

Boston, Mass.

Experiments are being made with an air separation device for grading sardines into various sizes. The variation in size causes considerable loss during the preparation of the pack and accounts for overcooking of the smaller fish. An efficient device for size-grading would be of immeasurable value to the industry.

College Park, Md.

Interest in the packaging of fishery products remains high, and numerous requests for packaging information have been received. A representative of a package manufacturing concern that serves a large part of the southern fishing industry visited the laboratory to obtain information on package requirements and offered to supply containers for experimental use.

Work on the toxicity of DDT is being continued. To date, the results indicate that the insecticide behaves as a cumulative poison when the birds are fed DDT-treated crab meal in the ration. This finding is contrary to previous reports by other investigators.

A special apparatus has been designed for blowing oil at constant high temperatures not attainable by the use of an open thermo-regulated bath. The device is made of pyrex glass and utilizes the hot vapors of boiling and refluxed constant-boiling petroleum fractions to heat the fish oil and maintain it at a constant temperature.

Preliminary blowing tests show that color is depleted to a certain point by blowing with oxygen, but thereafter, the oil darkens rapidly. Removal of soaps improves the final color. Bleaching the oil to a lighter initial color or stopping the oxidation after the first bleaching (while blowing) and finishing the polymerization under nitrogen results in a lighter colored oil.

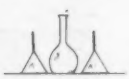
Two shipments by air of fresh-shucked oysters have been made from the Hampton Roads, Virginia, area to Chicago, Illinois. In each case, the temperature rise was about $\frac{3}{4}^{\circ}$ F. per hour of shipping time. Several series of oysters on the half-shell were frozen and treated with various protective coatings. These were stored at 0° F. and will be examined periodically for quality.

In order to determine the significance of the enterococci as a pollution index, the prevalence of these bacteria in various wild and domesticated animals is being studied. Of all specimens thus far examined, the muskrat is the only one which does not carry enterococci in the intestines.

Seattle, Wash.

Periodic examinations of precooked frozen products are being made. Methods of thawing frozen fish are also being investigated.

A comprehensive study of the Carr-Price (antimony trichloride) method of vitamin A analysis has been initiated. This method is believed to be more reliably in agreement with the biological method than the ultra-violet determination.



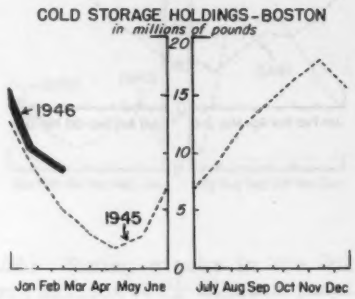
Mayaguez, Puerto Rico

The economic survey of the fisheries of Puerto Rico is being continued. Efforts are being made to estimate the total capital investment and working capital in the Puerto Rican fisheries.

Fish poisoning investigations have been temporarily stopped until shipments of fish are received from the Virgin Islands. The Puerto Rico Agricultural Company has resumed its fishery operations, and the first shipment of fish is expected in the near future.

FRESH AND FROZEN FISH

New England

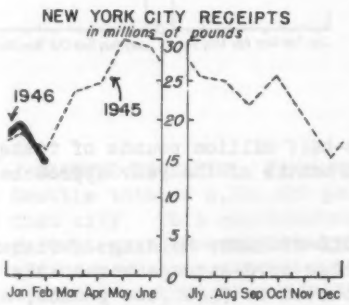


BOSTON COLD-STORAGE: Holdings of fishery products in Boston cold-storage plants on February 27 totaled 8,361,000 pounds, according to the Service's local Market News Office in that city. This was a decline of 19.8 percent as compared with holdings on January 30.

Although the boat tie-up at Boston curtailed production to about 25 percent of normal, holdings on February 27 were 21 percent above the 5-year average for that date.

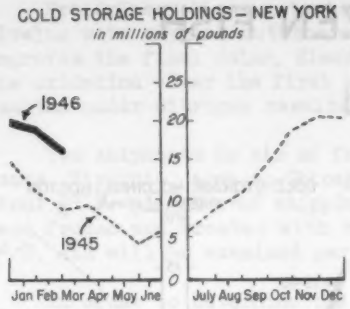
Middle Atlantic

NEW YORK CITY RECEIPTS: Fish and shellfish received in the New York market during February totaled 14,630,000 pounds, according to the Service's Market News Office in that city. This was about 1,700,000 pounds below the February 1945 figure. Leading items were cod, fluke, whiting, haddock, yellowtail, scup, and flounder. Compared with arrivals in February 1945, cod, haddock, and yellowtail displayed a slight decline in their respective totals, but shrimp showed an increase of about 175,000 pounds during February as compared with the same month's figure last year.



The combined total receipts of bluefish, king and Spanish mackerel, and mullet, all of which come from southern States, dropped about 690,000 pounds below the combined totals of these same species for February 1945.

Out of a total of 18 working days during the month of February, there were only three days when the market was generally active; one day it was active for groundfish only; and on only two days was it moderately active. On the other 12 days, the market was sluggish. Dealers were expecting the demand for seafood to increase greatly during the Lenten season.

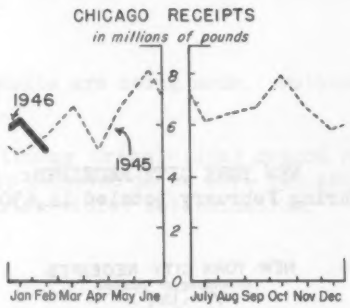


NEW YORK CITY COLD-STORAGE HOLDINGS: Although holdings of fishery products in New York's cold-storage warehouses declined 1,700,000 pounds during February, they were, on March 1, double those of the same date in 1945, according to the Service's Market News Office in that city. Cod fillets, Boston mackerel, sablefish, salmon, and whiting were the leading salt-water items; ciscos and whitefish led among the fresh-water species, and among shellfish, shrimp and squid stocks were the largest.

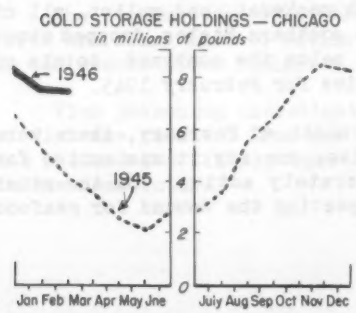
Great Lakes

CHICAGO RECEIPTS: Receipts of fresh and frozen fishery products in the Chicago wholesale market during February totaled 5,105,000 pounds. This was a decline of 18 percent as compared with the January total and 9 percent below February 1945 receipts, according to the Service's Market News Office in that city.

Compared with the previous month, fresh-water receipts dropped 13 percent during February, but were only 1 percent below the February 1945 figure. Salt-water receipts in February declined 36 percent as compared with those of January and fell 23 percent below those of February 1945.



Dealers were concerned about the seven and one-half million pounds of fishery products in public cold-storage as the most productive months of the year approached.



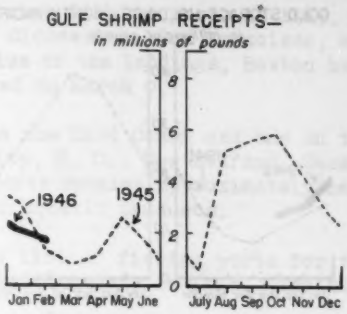
CHICAGO COLD-STORAGE: Holdings of fishery products in Chicago cold-storage warehouses on February 28 amounted to 7,400,000 pounds, according to the Service's Market News Office in that city. Although this represented a decline of 2 percent as compared with holdings on January 31, it was 78 percent greater than total holdings on March 1, 1945.

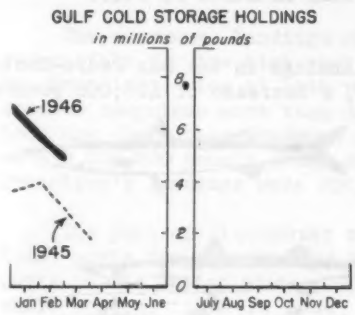
The receipt in February of a large quantity of whitefish, which led all varieties in freezings during the month, together with a sluggish demand for fresh-water species, held the decline in cold-storage stocks to a comparatively small figure. Holdings of fresh-water species increased 11 percent during the month.

Gulf

PRODUCTION: Shrimp production in the Gulf area during February was 30 percent below January landings, but was slightly ahead of the February figure in 1945 and the 5-year average, according to the Service's Market News Office in New Orleans.

Oyster canning activities rose to full production, with many plants changing from the canning of shrimp to oyster canning. Of February's production of oysters--60,000 barrels--which was double receipts of this species for January, half went into cans.



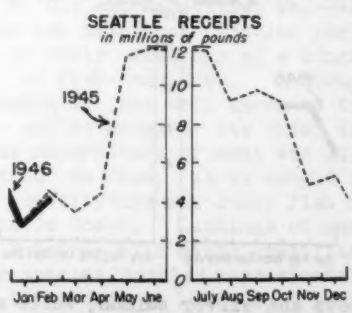


COLD-STORAGE: Shrimp stocks in the Gulf area shrank from 3 million to 2¼ million pounds in February, but were still larger than the 1-1/3 million pounds held on March 1, 1945, according to the Service's Market News Office in New Orleans.

Frozen fish holdings in Gulf warehouses increased slightly, totaling 2½ million pounds on March 1, nearly double the stocks of March 1, 1945.

Pacific

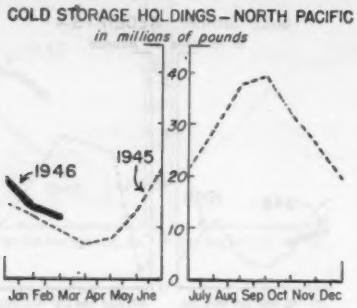
SEATTLE RECEIPTS: February's receipts of fresh and frozen fishery products at Seattle totaled 4,224,000 pounds, according to the Service's Market News Office in that city. This represented an increase of 44 percent over January receipts. Moderation of offshore weather conditions during the month permitted a much higher production by the otter-trawl fleet.



Receipts from Alaska amounted to 1,798,000 pounds during February. This was 43 percent of the month's total arrivals, and 37 percent higher than Alaska shipments in January. These receipts consisted mainly of halibut, silver and chum salmon, and sablefish.

With the bulk of the halibut fleet rigging-up, re-converting, and otherwise preparing for the coming halibut fishing season, and a slacking off of operations of small shark and gill-net craft, Seattle was dependent almost entirely upon landings of the dragger boats for its daily supplies of fresh fish during February.

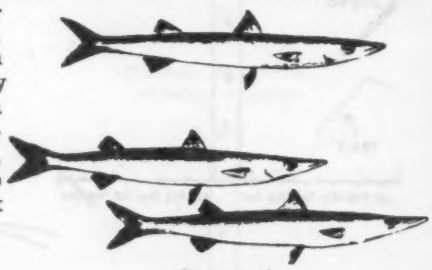
NORTHWEST COLD-STORAGE HOLDINGS: Although freezings of fish and shellfish in cold-storage plants in Washington, Oregon, and Alaska totaled 3,150,000 pounds during February, withdrawals of frozen stocks exceeded receipts to the extent that holdings dropped 1,505,000 pounds between February 1 and March 1, a decline of 11 percent, according to the Service's Market News Office at Seattle.



More than one-half of the area's stocks were held in Washington plants, the balance being fairly evenly distributed between those of Oregon and Alaska.

Cured fish holdings throughout the North Pacific area also showed heavy withdrawals in February, stocks of these commodities dropping from 2,045,000 pounds on January 31 to 1,429,000 pounds on March 1. However, stocks of cured fish were 107 percent heavier on March 1 than on March 1, 1945.

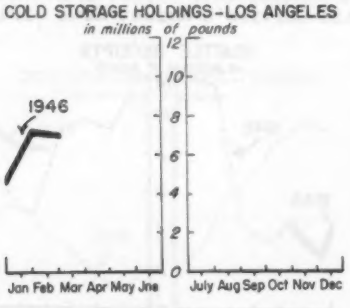
LANDINGS IN SOUTHERN CALIFORNIA: Fresh fish landings in the San Pedro-Santa Monica area totaled 496,000 pounds during February, a decrease of 406,000 pounds as compared with January landings. The greatest decline was shown in mackerel receipts, which dropped 76 percent. The mackerel season came rapidly to a close the latter part of January and was responsible for the marked decrease in landings of this species. Although other decreases appeared in sardine, rockfish, smelt, Spanish mackerel, and yellowtail, gains were noted in the catch of barracuda, cabrilla, black sea bass, and shark.



Barracuda

San Diego receipts showed a decided increase during February, with 297,000 pounds landed compared with 80,000 pounds for January. Noticeable gains appeared in landings of yellowtail, black sea bass, halibut, and barracuda.

CALIFORNIA COLD-STORAGE HOLDINGS: February freezings of fish and shellfish in California plants showed an increase over January with 297,000 pounds frozen. The freezings were far below those for February 1945, when 425,000 pounds were frozen, the Service's Market News Office at San Pedro reported.



Fishery products held in California cold-storage warehouses on March 1 totaled 7,349,000 pounds, a net reduction of 278,000 pounds compared with holdings on February 1, but 4,536,000 pounds greater than stocks held on March 1, 1945.

Between February 1, and March 1, noticeable decreases occurred in holdings of flounder fillets and silver salmon, while marked increases were found in holdings of smelt and shrimp. Almost without exception, holdings on March 1 of all species were far in excess of those on March 1, 1945.

United States

U. S. FISHING PORTS: The leading United States fishing ports in 1945, in weight of fish landed, were San Pedro, Monterey, Gloucester, San Francisco, and Boston, in the order named, but in terms of the value of the landings, Boston held first place, the Fish and Wildlife Service reported on March 9.

Following the leading five were four ports on the East Coast and one on the Pacific Coast: Lewes, Del.; Beaufort-Morehead City, N. C.; New Bedford, Mass.; San Diego, Calif.; and Reedville, Va. These ten ports receive approximately half of the nation's total production of fish and other aquatic products.

San Pedro, which has held first place on the list of fishing ports for two years in succession, handled approximately 480,000,000 pounds in 1945. The bulk of the landings at San Pedro are pilchards or sardines, although tuna and mackerel also are landed in considerable quantity at this port.

PILCHARD

The enormous landings of pilchards are responsible for the high rank of Monterey and San Francisco, for at both ports this single species comprises more than 90 percent of the landings. Last year, Monterey received a total of 330,000,000 pounds of all species, while San Francisco's landings were 200,000,000 pounds.

The port of Gloucester not only has held the leading place among Atlantic Coast ports for three consecutive years, but in 1945, was one of the three principal ports of the United States. Gloucester, in third place, received 213,000,000 pounds, while Boston, fifth in rank, handled 188,000,000 pounds. These ports are the country's principal centers for the production of fresh fish, their landings consisting chiefly of haddock, rosefish, cod, flounders, mackerel, and other species handled almost exclusively by the fresh fish markets.

Although Boston's landings were smaller than Gloucester's by about 25,000,000 pounds, their total value was greater--$13,790,000 as against $11,184,000 for the Gloucester landings. Haddock and cod, which are the chief items in the landings at Boston, bring a higher price than the rosefish which made up about 48 percent of the Gloucester receipts.

MENHADEN

Three towns on the Atlantic Coast--Lewes, Del.; the Beaufort-Morehead City area of N. C.; and Reedville, Va.--are among the ten principal fishing ports because of their landings of a single species of fish--menhaden. Although the menhaden is not well known to the general public because its chief use is in the manufacture of meal and oil, rather than as food, it is caught in greater quantity than any other fish on the Atlantic Coast. Landings of menhaden, together with minor quantities of other species, totaled approximately 175,000,000 pounds at Lewes last year. The Beaufort-Morehead City area received about 143,000,000 pounds, of which probably 90 percent was menhaden.

The rapidly growing port of New Bedford increased its landings from 75,000,000 pounds in 1944 to 101,000,000 pounds last year, ranking eighth on the list of United States ports. Like Gloucester and Boston, New Bedford is a fresh fish center, flounders and haddock predominating in its landings.

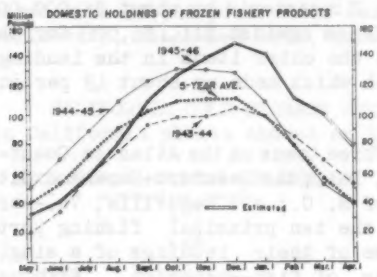
San Diego, in ninth place, received about 100,000,000 pounds in 1945, with tuna its most important species. Because of its southern location, this port is the principal place of landing for the large tuna clippers that fish off the coast of Mexico and Central America.

Reedville, ranking tenth on the list, received about 80,000,000 pounds, almost entirely menhaden.

Among other ports with landings ranging between 40,000,000 and 80,000,000 pounds, are Fernandina, Fla., which received about 74,000,000 pounds, chiefly menhaden; Astoria, Ore., with about 48,000,000 pounds; and Seattle, Wash., and Provincetown, Mass., with about 42,000,000 pounds each.

COLD-STORAGE FREEZINGS AND HOLDINGS: Holdings of frozen fish and shellfish on March 1 were 72 percent above the average for that season of the year, totaling 99 million pounds, according to the United States Fish and Wildlife Service's Current Fishery Statistics No. 257.

Although inventories of frozen seafoods declined nearly 50 million pounds from their winter peak of 148 million pounds reached on December 1, withdrawals proceeded at a rate considerably less than normal. In 1945, holdings on March 1 were only 53 million pounds.



Reports reaching the Fish and Wildlife Service in the two weeks after March 1 indicated that stocks of frozen fish, at least in some areas, had begun to move more rapidly, probably reflecting the Lenten demand. Heavy withdrawals were reported from Boston, where production of fresh fish had been sharply reduced by a labor disagreement, and from New York and Chicago.

Holdings of fishery products in cold-storage and freezing establishments on March 1 included 73 million pounds of salt-water fish, 10 million pounds of fresh-water species, and 16 million pounds of shellfish.

CANNED AND CURED FISH

Pilchard

PILCHARD PACK: During February, landings of pilchards at California ports continued to trail those of the 1944-45 season, with a decline of 4,589 tons under the February 1945 figure, according to reports from the California Sardine Products Institute and the California Division of Fish and Game. The pack of canned pilchards from January 28 to February 23 amounted to 150,016 standard cases, a decline of 40,584 standard cases compared with the corresponding period in 1945. The season's pack from August 1 to February 23 rose to 3,723,145 standard cases, an increase of 57,140 standard cases over the 1944-45 figure to February 23.

California Sardine Landings, Canned Pack and Byproducts

Item	Unit	MONTH 1946 Jan.28-Feb.23	MONTH 1945-46 Dec.31-Jan.26	MONTH 1945 Jan.28-Feb.23	SEASON 1945-46 Aug.1-Feb.23	SEASON 1944-45 Aug.1-Feb.23
Landings	Tons	11,125	30,080	15,714	392,330	545,650
Canned	1 lb.ovals-48 per case	40,158	106,846	61,354	1,150,464	1,395,077
	1 lb.talls-48 per case	105,902	291,979	122,463	2,429,724	2,111,038
	½ lb.fillet-48 per case	-	-	11	-	5,038
	½ lb.round-96 per case	1,894	2,043	827	47,785	56,849
	Unclassified	2,062	1,505	5,950	95,172	100,522
	TOTAL, Std. 1 lb.-48 per case	150,016	402,373	190,600	3,723,145	3,666,005
		February	January	February	Aug.-Feb.	Aug.-Feb.
Meal	Tons	1,134	4,593	2,111	56,515	83,973
Oil	Gallons	58,196	367,091	175,530	11,230,607	17,702,612

Shrimp

SHRIMP PACK: As shrimp continued to have a vigorous demand in the fresh market, canning operations were light during February, according to reports to the Food and Drug Administration from plants served by its Seafood Inspection Service. Only 2,108 standard cases of shrimp were packed from February 3-23, bringing the season's total to 124,235 standard cases, 283,481 standard cases below the 1944-46 figure to February 22.

Wet and Dry Pack Shrimp in all Sizes in Tin and Glass--Standard Cases*

MONTH			SEASON		
1945 Feb.3-23	1945 Jan.6-Feb.2	1944 Feb.4-24	1945-46 July 1-Feb.23	1944-45 July 1-Feb.24	5-yr.-average July 1-Feb.22
2,108	5,260	2,708	124,235	407,716	537,658

*All figures on basis of new standard case--48 No. 1 cans with 7 oz. per can in the wet pack and 6½ oz. per can in the dry pack.

Tuna

TUNA PACK: The production of canned tuna by California packers during February totaled 156,600 standard cases, according to the California Division of Fish and Game. This was 41 percent greater than the pack for February 1945.

Yellowfin tuna accounted for more than half of the pack. For the first two months of 1946, the total pack amounted to 326,800 standard cases, exceeding that of the corresponding period in 1945 by 88 percent.

The February pack of mackerel--13,200 standard cases--was 71 percent larger than that of the same month last year, but was 62 percent below the January production. The pack for the first two months of 1946 amounted to 48,300 standard cases, 18 percent less than the total pack for January and February 1945.

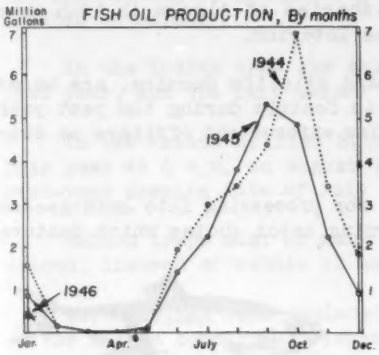
California Pack of Tuna and Mackerel--Standard Cases*

Item	February 1946	January 1946	February 1945	Two mos. ending with February 1946	Two mos. ending with February 1945
	Cases	Cases	Cases	Cases	Cases
Tuna:					
Albacore	-	-	41	-	1,448
Bonito	1,676	1,325	90	3,001	1,490
Bluefin	18,422	8,929	5,454	27,351	5,454
Striped	11,321	8,880	10,749	20,201	19,811
Yellowfin	84,793	129,750	74,027	214,543	114,593
Yellowtail	15,800	514	561	16,314	582
Flakes	24,593	20,759	20,105	45,352	30,673
Total	156,605	170,157	111,027	326,762	174,051
Mackerel	13,226	35,049	7,718	48,275	58,838

*Standard cases of tuna represent cases of 48 7-ounce cans, while those of mackerel represent cases of 48 1-pound cans.

FISHERY BYPRODUCTS

Oil and Meal

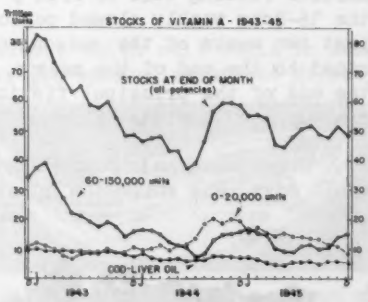


PRODUCTION: Only a small quantity of fish oil is produced during the months of February through May. Heavy production starts in June and continues through the following January, with peak production occurring during September and October.

The production of fish oils during January totaled 432,994 gallons compared with 918,455 gallons produced during the same month of 1945 and 1,592,627 gallons during January 1944, according to the Service's Current Fishery Statistics No. 256. Although complete data were not available on meal and scrap, items which normally account for about 94 percent of the total production showed an output of 6,928 tons during January 1946, compared with 9,997 tons during January 1945.

Vitamin A

STOCKS AND PRODUCTION: Stocks of vitamin A in fish liver oils on December 31 were reported at 49 trillion units, a decline of 6 percent under stocks held on the first of the month and 17 percent less than those of December 31, 1944, according to the Service's Current Fishery Statistics No. 253.



Production of vitamin A during December totaled 5.1 trillion units compared with 4.6 trillion units produced during December 1944. Total production during 1945 amounted to 62.6 trillion units compared with 73.8 trillion units produced during 1944, a decline of 15 percent.

Receipts of livers during December totaled 784,000 pounds, containing about 5 trillion units of vitamin A. During the same month of 1944, 990,000 pounds of livers, having a vitamin A content of 4.5 trillion units, were received.

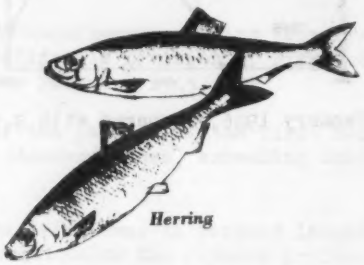
OTHER FISHERY NOTES

1946 Alaska Regulations

Containing changes of importance to both fishermen and packers, the new regulations for the protection of the commercial fisheries of Alaska in 1946 were issued on March 23, by the U. S. Department of the Interior.

These regulations, recommended by the Fish and Wildlife Service, are based upon testimony presented at public hearings held in Seattle during the past year and upon investigations of fishery biologists and law enforcement officers on duty in Alaska.

More herring will be available again this year for processing into much-needed oil and meal as the result of the increase in herring catch quotas which feature the 1946 regulations. In the Kodiak and Southeastern Alaska areas, herring are sufficiently abundant now, because of a series of successful spawning years, to permit the taking of an additional 150,000 barrels during the 1946 season, raising the total take in these two areas to 700,000 barrels.



Herring

In the Kodiak area, the quota has been increased from 300,000 to 400,000 barrels and in the Southeastern Alaska area, from 250,000 to 300,000 barrels.

Persons engaged in the salmon industry will be interested in a number of changes in seasons which have been made in the Southeastern Alaska area in order to more nearly synchronize open seasons with the pink salmon runs in the various districts.

In the Icy Strait, Eastern and Western districts, the opening dates for commercial fishing will be from 5 to 10 days later than last year. In most districts, the 36-hour weekly closed period has been extended to 60 hours during all but the last two weeks of the season, and several days additional fishing time have been added to the end of the season. If additional fishing time is warranted following the end of the principal fishing season, provision has been made for a series of 51-hour open periods, alternating with short closed periods.

Other changes in Southeastern Alaska reduce the closed season on salmon trolling by 10 days, and shift the opening date for fall fishing from October 20 to October 15. A proposed postponement to May 1 of the opening date for taking sablefish was suspended for the current season, when it developed that such postponement would cause unexpected hardship to local fishermen.

Because the Service anticipates a red salmon run of less than normal volume in the Bristol Bay area this year and an increase in fishing operations, the midweekly closed period has been extended from 24 to 36 hours to apply in all sec-

tions of the area. The Egegik District has been reopened to commercial fishing after a one-year closure.

To provide additional protection for both the red salmon and pink salmon runs in the Alaska Peninsula area, the 36-hour weekly closed period has been increased to 60 hours. On the south side of the Peninsula the regular season will terminate August 10, two days earlier than last year. On the north side of the Peninsula a catch limit of 500,000 red salmon is provided for the Port Moller section, and the open season is increased by 15 days to permit the greater utilization of other species of salmon.

In the Kodiak area the salmon fishing season will end one day earlier than last year, and the fall season will open on September 10 instead of September 1.

In the Prince William Sound area the salmon fishing season will terminate this year at 6 a.m. on August 7, an extension of 36 hours over 1945. The usual even-year opening date of July 10 will be in effect.

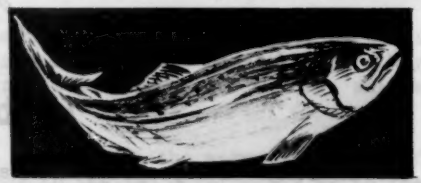
Salmon traps must be made inoperative within 24 hours after the close of the season, instead of within 12 hours, as formerly.

War time has been replaced by standard time as a basis for the enforcement of the Alaska commercial fishery laws and regulations.

Amendment to Alaska Regulations

No action will be taken at this time either to impose an upper limit on salmon trap site holdings in Alaska or to establish a general system of preferences with respect to occupancy of trap sites, the U. S. Department of the Interior announced on March 6, in issuing the notice of amendments to the 1946 Alaska Fishing Regulations.

Since preparations for the Alaska salmon season, which will begin in some districts in May, are already under way and a heavy pre-season investment already has been made by last season's occupants of trap sites, it appears unlikely, if sites were to be thrown open to competition by imposition of a twenty-trap limitation, that they could be supplied with traps and effectively occupied by newcomers in 1946. The uncertainty as to which sites would be or should be subjected to competition and the practical difficulties of time and cost would inevitably result in a curtailment of this year's output of canned salmon, and this result the Department is not willing to create or permit in view of the international food shortage.



The new Alaska fishing regulations will, however, prohibit occupants of ten or more sites from acquiring additional sites. This, according to the Department, would effect no discernible change in the volume of 1946 production.

Hearings on the proposed changes in the Alaska fishing regulations were held in Washington from February 21 to February 25. Because of the distance and expense

involved in bringing interested parties to Washington to testify, the hearings will be resumed in Alaska, with reference to the 1947 regulations, following the close of the 1946 fishing season.

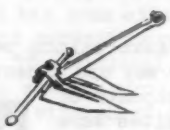
The hearings will be held in Kodiak, Seldovia, Cordova, Juneau, Sitka, Klawak, Wrangell, and Ketchikan in the fall.

It developed in the course of the hearing, that a comparatively small number of those who hold War Department permits for trap sites did not themselves operate the traps, but simply leased, for a substantial rental, the right to use the site. In the opinion of the Department, there can be no defense of a system under which a private individual is able to lease for a profit a part of the public domain, and the practice should be stopped as soon as possible.

The beneficiaries of this system, however indefensible it may appear, are entitled to be heard before the system is changed. It accordingly seems best to defer action until the 1947 season, and merely to serve notice at this time that the permit holder who leases, rather than operates, his trap site in 1946 is not likely to be allowed to occupy the site in 1947.

Although the Department's salmon conservation program in Alaska has succeeded in reducing the number of trap sites to 440, from 799 in 1924, 221 of those sites are now occupied by eight companies, and for several years, no trap sites have been available to newcomers in the field. This is a condition the Department, as the guardian of the public resources, is anxious to see corrected.

Administrative regulation or statutory action in this field is not confined to the Federal Government. The White Act expressly disclaims any intention to deny to the Legislature of Alaska the power to regulate the fishing industry by licensing or taxation. The Territorial Legislature meets in special session within a few days. In accordance with the Department's policy of favoring increased legislative responsibility in the territorial areas, it is appropriate and desirable that an opportunity be given to the Alaskan Legislature to enact suitable legislation to deal with this problem. Appropriate and effective action by the Legislature may obviate the necessity for further changes in the 1947 regulations.



Halibut Allocation

Hearings on a proposed allocation program for Pacific Coast halibut during the 1946 season will be held in Seattle on April 10, the Fish and Wildlife Service announced on March 27.

Members of the industry and interested Government agencies will be given an opportunity at the hearings to present their views as to the necessity for allocation of the halibut catch and as to the character of the program if adopted.

Allocation of halibut by the Interior Department was first undertaken in 1944 and was continued in 1945. The Department has been requested by the Office

of Price Administration to adopt a similar program this season in the interest of proper price control and of avoiding disturbance of normal channels of distribution.

The halibut fishery presents an unusual problem, because the size of the catch is rigidly limited under the terms of an international treaty with Canada. Under this treaty a catch of 52,500,000 pounds is authorized for 1946.

Alaska Resource Committee

A special committee to formulate recommendations to develop Alaskan resources has been appointed by President Truman. It consists of the Secretaries of Interior, Agriculture, and Commerce.

International Salmon Fisheries Commission

On March 19, the White House announced that the President had designated Mr. Milo Moore, Director of the Department of Fisheries of the State of Washington, a member on the part of the United States of the International Pacific Salmon Fisheries Commission to fill the position left vacant by the resignation of Mr. Charles E. Jackson.

Mr. Jackson, formerly Assistant Director of the Fish and Wildlife Service, was recently appointed General Manager of the National Fisheries Institute. In accepting Mr. Jackson's resignation, President Truman expressed his appreciation for the services rendered by Mr. Jackson as one of this Government's members of the Commission.

The International Pacific Salmon Fisheries Commission was established pursuant to Article II of the Convention between the United States and Canada, signed May 26, 1930, for the regulation, preservation and extension of the sockeye salmon fisheries of the Fraser River System.

The primary duty of the Commission is to investigate the natural history of the salmon fisheries and to make recommendations to the two Governments as to the best measures for the regulation of the fisheries with a view to conservation and restoration.

Fish Production Goals

On March 6, the Department of Agriculture announced its fish production goals for 1946. These are:

Canned fish and shellfish	-	811,000,000 pounds
Cured fish	-	100,000,000 "
Fresh and frozen fish and shellfish	-	1,701,000,000 "
Fish meal	-	265,000 tons
Fish liver oil (not including imported oils or vitamin A made therefrom)	-	70 trillion units of vitamin A

The goals are substantially the same as those established last year, with the exception of cured fish. Because of the demand and the removal of wartime regulations, the goal for cured fish has been set at 10,000,000 pounds above that for 1945. The general food situation would have justified higher goals, but it was necessary to keep the goals within the limits of quantities likely to be produced.

The goal of 265,000 tons for fish meal falls considerably short of fish meal needs for livestock and poultry feeding. However, the world food situation has made it necessary to give preference to foods for direct human consumption rather than for use as animal feed, fertilizer, or related uses.

Clam Farming

The yield of the United States clam fisheries could be nearly doubled in volume, with a corresponding increase in value, if scientific methods of cultivation were applied to this valuable resource, the Fish and Wildlife Service announced on March 21.

Although current production of clams is slightly more than 30 million pounds annually, most of this quantity is taken from uncultivated grounds and represents the harvesting of a wild crop. The application of modern methods of shellfish cultivation by State or local governments or by private individuals, where feasible, would greatly increase the yield and value of this resource.

The Atlantic Coast clam fisheries, which furnish about 95 percent of the total United States production, depend largely on two species, the soft-shelled clam and the hard clam or quahog. Both species grow in inter-tidal or shallow water and are thus easily cultivated.

Cultivation of soft clams may be successfully undertaken in almost any protected area north of New Jersey. Many beds, which at present are almost barren or entirely devoid of these animals, could be converted with comparatively little effort into clam-growing farms. Utilization of such areas would result in an increased supply of clams for the market, and in the conversion of thousands of acres of unproductive bottoms to a source of revenue. The cultivation of hard

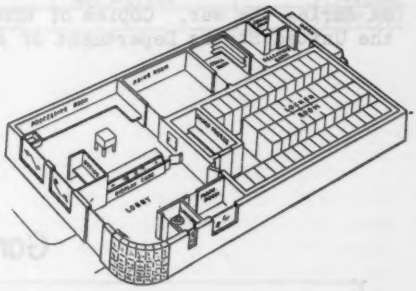
shell clams--which are found from Maine to Florida--may also be rendered a very profitable and dependable business, provided some fundamental rules are observed in selecting the ground for the farm and taking care of it.

Where clam beds are available for private leasing, returning war veterans would find a profitable outdoor occupation in clam farming, according to Dr. Loosanoff, Service Biologist. The clam farm requires less care than the agricultural farm and offers more profit. Hard clam farms, under cultivation, can yield as much as 600 bushels of 2½-inch clams per acre annually, it is estimated. At current prices, this represents an income of $1,800 to $2,400 per acre of cultivated bottom.

In addition to the hard and soft clam fisheries, two new clam industries were developed during the war on the Atlantic Coast--a fishery for the surf clam in the Long Island area and one for the ocean quahog in Rhode Island and Massachusetts. Since both species inhabit deep water, it is believed that cultivation of these clams would be difficult, if not impossible.

Frozen Foods and Lockers

A list of sources of basic information on frozen foods and lockers has been compiled by the United States Department of Commerce. This 15-page leaflet, entitled Frozen Foods and Lockers, enumerates the government publications, recent articles in trade papers and magazines, and other sources which contain information and statistics on these subjects. The publication is available, free of charge, from the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington 25, D. C.



Vitamin Oils

The Department of Commerce has issued a 6-page report on United States trade in vitamin oils as a part of its Industrial Reference Service. This leaflet discusses production, extraction, refining, consumption, costs, prices, wartime regulations, organization of the industry, foreign trade, and market possibilities. Copies of Part 2 to the November 1945 Industrial Reference Service, "The Vitamin Oil Trade--United States," can be obtained for 5 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Exporters

For the convenience of exporters, the Department of Commerce's Office of International Trade Requirements and Supply Branch has issued a revised Positive List of Commodities. This list includes all commodities which require export licenses for shipment to Group K destinations. Included in this list are a number of salted, dried, and canned fishery products, as well as fish and whale oils and fish meal. The Current Export Bulletin No. 319 may be obtained from the Department of Commerce, Washington 25, D. C.

Packages and Containers

The Bureau of Agricultural Economics of the United States Department of Agriculture recently has completed a 64-page mimeographed booklet entitled Packages and Containers for Marketing Foods. This publication discusses the effects of the war on packaging and packaging materials and predicts the changes in materials and uses which will develop as an outgrowth of new discoveries and practices brought on during the war. Copies of this publication are available, free of charge, from the United States Department of Agriculture, Washington 25, D. C.

Game Fish Licenses

A recent summary issued by the Fish and Wildlife Service shows that 8,280,000 fresh-water anglers in the 48 States paid $10,580,000 into the State treasuries during the fiscal year ended June 30, 1945. This was an increase of 450,000 licenses over the previous fiscal year.

Purchases of Fish by Department of Agriculture

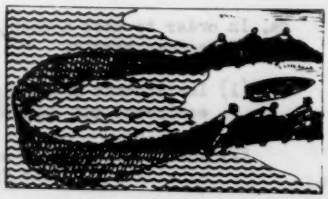
January 1946 purchases of fishery products by the United States Department of Agriculture displayed a gain of $2,718,278 in value over December 1945. Compared with the 1944 total, purchases for the year ending December 31, 1945, declined $26,319,200 in value.

Purchases of Fishery Products by USDA

Commodity	Unit	January 1946		January-December 1945	
		Quantity	F.O.B. Cost	Quantity	F.O.B. Cost
FISH AND SHELLFISH			Dollars		Dollars
Herring, canned	Cases	-	-	81,660	434,189
Mackerel, "	"	4,212	20,534	276,490	1,458,249
Pilchards, "	"	76,570	282,567	1,763,844	6,879,892
Salmon, "	"	261,565	2,901,323	1,910,582	19,085,396
Sardines, "	"	7,175	33,929	1,454,967	5,866,313
Shrimp, "	"	-	-	307,500	1,491,375
Tuna and tuna-like fish, "	"	-	-	53,828	569,932
Fish, flaked, "	"	-	-	20,267	205,986
Fish, ground, "	"	-	-	125,887	365,506
Total .... "	"	349,522	3,238,353	5,995,025	36,356,838
Fish, brine-cured	Pounds	-	-	40,000	8,000
" , dry-salted	"	-	-	20,309,570	3,259,100
" , smoked	"	-	-	1,531,600	162,123
Total	"	-	-	21,881,170	3,429,223
BYPRODUCTS					
Feeding oil	"	-	-	41,000	15,990
Fish meal	"	-	-	2,880,000	115,125
Oyster shell	"	-	-	160,000	640
Oyster shell flour	"	-	-	320,000	1,120
Oyster shell grits	"	-	-	440,000	1,604
Total	"	-	-	3,841,000	134,479
VITAMINS					
Vitamin A fish-liver oil	M Units	-	-	14,502,262	3,902,447
Grand Total		-	3,238,353	-	43,822,987

HAUL SEINES

Haul seines are operated from shore to take fish that are concentrated close to the beaches. The seine is dropped in a wide circle offshore and is then hauled toward the beach, encircling the fish. Hauling is done by hand (small seines) or by power (large seines). Some of the largest haul seines are operated in the lower Chesapeake, and the sounds of North Carolina, taking spot and croakers. Weakfish (sea trout) are taken in night seining in the Peconic Bays of Long Island in summer.



Conservation Bulletin No. 38

FOREIGN FISHERY TRADE

Imports and Exports

GROUNDFISH IMPORTS: From January 1 through March 2, 1946, there were 7,121,792 pounds of fresh and frozen groundfish imported into the United States, the Bureau of Customs of the Treasury Department reported on March 14. The reduced tariff quota for the year is 15,000,000 pounds, or 15 percent of the average apparent consumption of the past three years.

Commodity	Feb.4-Mar.2,1946	Jan.1-Feb.2,1946	February 1945	Jan.-Feb.1946	Jan.-Feb.1945
Fish, fresh or frozen fillets, steaks, etc., of cod, haddock, hake, cusk, pollock, and rosefish	3,497,892	3,623,900	2,549,383	7,121,792	3,908,681

Japan

POST-WAR FISHERIES: The following policy conclusions with respect to the treatment of Japanese fishing and aquatic industries during the occupation period have been approved by the State-War-Navy Coordinating Committee. They have been incorporated in a Directive from the Joint Chiefs of Staff to the Supreme Commander for the Allied Powers, General of the Armies Douglas MacArthur, dated November 19, 1945. They were released on February 18 as a further step in the State Department's program to release to the public, as rapidly as security conditions warrant, full information concerning the Japanese occupation policies which have been adopted by the United States on behalf of the Allies:

> "During the period of occupation, the Supreme Commander should be guided, subject to military considerations, by the following general principles:
>
> "a. In order to meet domestic consumption requirements, the Supreme Commander should:
>
> (1) Insist that appropriate available vessels, facilities, gear, equipment and supplies in Japanese hands be put to use;
>
> (2) Take such steps as he may deem practical and necessary to provide sufficient fuel for allocation to fishing boats;
>
> (3) Require the Japanese Government to rehabilitate the production facilities of the fishing, fish fertilizer and seafood processing industries, and facilities for distribution of their products; and

(4) Furnish such other assistance, subject to general policies governing aid to Japanese industry, as he deems necessary.

"b. The coastal fisheries and fish culture should be utilized as the primary sources for domestic consumption. To the extent that fish culture and coastal fisheries are unable to meet the minimum domestic requirements, deep sea fisheries and other fisheries in water open to Japanese operation may be utilized where security and political considerations permit. Deep sea fishing in areas near United States territory or near United States island responsibilities should not be authorized. Japanese fishing should not be permitted near areas under Allied jurisdiction without prior permission from the country concerned. These prohibitions should continue until international agreements are negotiated permitting Japanese fishing in these areas.

"c. In order to determine (1) the effect on Japanese food supply of restrictive measures enforced for security or other reasons, and (2) the extent to which the United States and other nations should be permitted to exploit fisheries previously exploited by the Japanese, the Supreme Commander should immediately obtain from the Japanese Government available surveys and other data concerning the resources of all Pacific fishing areas previously exploited by the Japanese.

"d. Japanese fishing operations should conform strictly to:

(1) The provisions of agreements relating to whaling to which the United States is a party;

(2) The provisions of other agreements relating to conservation to which the United States is a party;

(3) The policies or rules governing specific fisheries announced by the United States, or by other governments in conformity with policies announced by the United States with respect to coastal fisheries;

(4) The Japanese national and local regulations for the conservation of fisheries.

"e. Such fishery products may be exported as can be produced by vessels, facilities, gear, equipment and supplies not suitable for or convertible to use in providing for domestic consumption, and which are needed (1) to supply United Nations needs for animal proteins and oils or (2) to secure foreign exchange for essential imports.

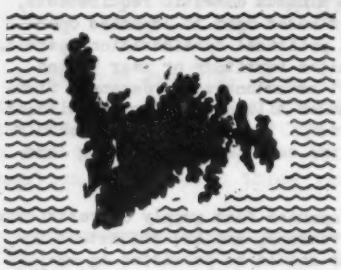
"f. In the establishment of local security regulations consideration should be given to ensuring the maximum production of seafood products consistent with security requirements."

Newfoundland

SEAL FISHERY: The history of the Newfoundland seal hunt is replete with adventure, romance, and tragedy, according to a report received by the State Department from the American Consulate General at St. John's, Newfoundland.

The report is extracted as follows:

Newfoundland's hair seal-fishery has been the subject of considerable comment and agitation during recent years owing to the fact that this once flourishing and not unimportant industry has sharply declined during the past several years.



The early seal-fishery in Newfoundland was prosecuted with seal nets, followed by ice-skiffs, gallopers, small schooners, brigs, brigantines, and barks. In 1855, 400 vessels were engaged, with 13,000 men. From that date, the decline in sailing vessels commenced, and 25 years later sailing vessels in connection with the seal-fishery were a thing of the past. The employment of steamers in connection with the seal-fishery commenced in 1863; by 1906, 25 steamers were engaged, with 4,061 men. The number of steamers gradually declined, however, until 1938, when only eight, with 1,459 men, were employed, representing a fall in 32 years of 17 steamers and a decrease of 2,602 men.

The total number of seal skins exported from Newfoundland up to recent years reflected the declining number of ships and men employed. Until 1858, it was common for exports to exceed the half-million mark, with 1831 being the record year (686,836 seal skins). The half-million mark was never again reached, with the single exception of the year 1902 (527,686 seal skins). Average annual exports of seal skins during the early part of the 20th century averaged well over 200,000, but after World War I, dropped to an average of less than 150,000.

Probably the most reliable index of production can be found in export figures, inasmuch as available figures for annual seal catches cover only those caught by the sealing steamer fleet, excluding those caught by offshore nets and auxiliary vessels. However, since steamers have been responsible for the greater part of annual catches, statistics covering catches made by the sealing steamer fleets give a good picture of general trends.

The table below shows the number of steamers and men prosecuting the seal fishery, together with total catches in quantities and values, for the years 1936-1944*:

Production of Sealing Steamer Fleets 1936-1944,*Inc.

Year	No. of Steamers	No. of Men	Seals Caught	Net Value	Value to Men
1936	8	1,460	183,689	$224,495.22	--
1937	7	1,305	113,340	205,033.34	--
1938	8	1,459	226,747	490,664.42	$163,554.80
1939	7	1,291	97,345	149,399.36	49,766.45
1940	7	1,307	159,687	205,030.29	66,670.00
1941	4	606	42,666	67,178.63	22,131.00
1942	3	309	4,698	11,685.94	3,903.35
1944*	1	121	6,697	17,682.69	5,845.51

*No steamers prosecuted the sealfishery in 1943 and 1945.
All values in Canadian dollars. $1.00 U.S. - $1.10 Canadian.
Source: Compiled by writer from data in Annual Reports of Newfoundland Fisheries Board. 1944 figures furnished separately by the Board.

It may be observed from this table that the seal-fishery has irregularly declined until it has all but reached the vanishing point during the past few years.

During the two years when no steamers engaged in the seal fishery (1943 and 1945), a number of small wooden auxiliary vessels were employed, and landsmen caught a number of seals with the use of nets offshore. Unfortunately, no record was kept of the catch by each auxiliary vessel in these two years, nor are any figures available concerning the catch of seals by landsmen.

The following table shows exports of seal skins from Newfoundland for the fiscal years 1925 to 1945 by quantities and values:

Exports of Seal Skins from Newfoundland--Fiscal Years 1925-1945*

Year	Quantities	Values	Year	Quantities	Values
1925-26	132,509	$183,271	1935-36	154,973	$254,629
1926-27	174,693	258,690	1936-37	214,441	305,285
1927-28	336,269	606,517	1937-38	194,899	307,635
1928-29	187,449	444,198	1938-39	98,511	164,989
1929-30	184,613	349,858	1939-40	203,354	418,102
1930-31	202,543	321,942	1940-41	166,815	231,681
1931-32	40,617	62,965	1941-42	129,765	235,008
1932-33	132,660	232,762	1942-43 (9 mos.)	25,784	69,310
1933-34	229,917	535,717	1943-44	17,561	47,451
1934-35	154,937	285,614	1944-45	34,410	147,722

*Fiscal years ended June 30 to 1941-1942, inclusive; nine months period 1942-43 ended March 31; subsequent periods based on new fiscal period April 1-March 31. Quantities in imperial gallons: one imperial gallon equals 1.20094 U.S. gallons. Values in Canadian dollars: $1.00 U.S. equals $1.10 Canadian.

Source: Compiled by Newfoundland Fisheries Board from Annual Newfoundland Customs Returns.

With respect to general trends, it may be seen from this table that exports generally exceeded the 150,000 mark in quantity until 1942-43, when exports fell to about 25,000 and remained close to that figure in the succeeding two fiscal years. This was largely due to the depletion of the sealing fleet by loss of vessels at the icefields, requisitioning of vessels for war purposes, and so forth. The high point was reached in 1927-28 when over 336,000 skins were exported, about two-thirds of which went to the United States.

Seal oil exports fluctuated irregularly between about 300,000 and 800,000 imperial gallons,[1] from 1925-26 to 1941-42. Exports then fell well below the 300,000 mark, and reached figures below the 100,000 mark in succeeding fiscal years. During the war, the British market greatly diminished, and Canada became the leading market for the relatively small exports.

The United States market had already become unimportant through the imposition of a processing tax by the United States in 1934.

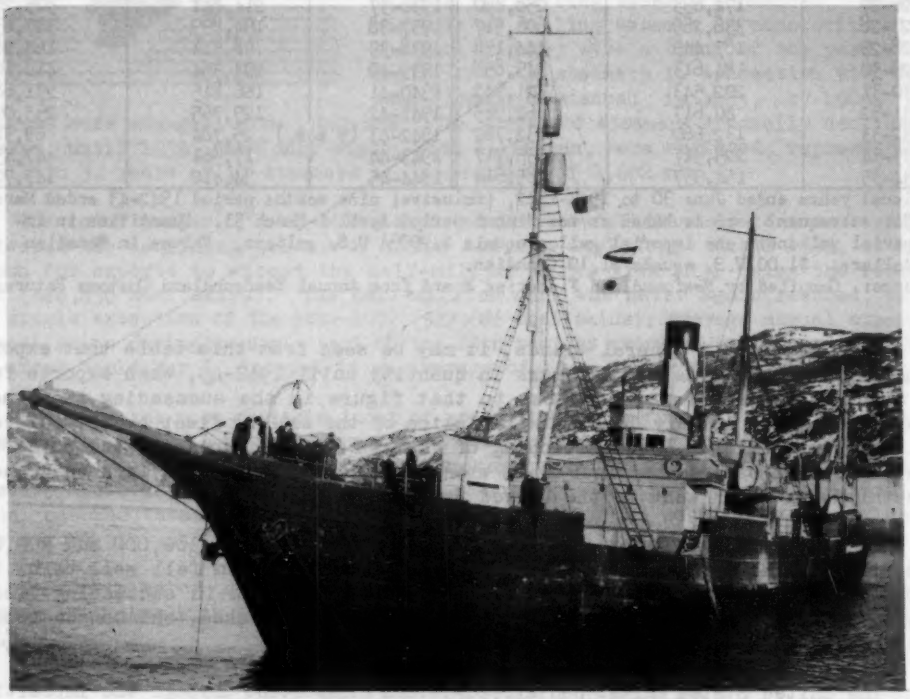
The most important of the varieties of seals hunted by Newfoundlanders are the Harp and the Hood of the Hair breed. The name "Harp" is given to the species because of a brown patch on the sides which is thought to resemble a harp. The "Hood" gets its name from the peculiar formation of the head of the male, which is covered with loose skin. The Harps are spotted cream and brown in color, and are about six feet long when fully grown. The Hoods are grey with brown spots; when fully grown they measure nearly nine feet and are much heavier than the Harps.

The Hoods come from the shores of Greenland, and are by nature a warlike tribe. Fierce and independent, they move in scattered families, riding the floes

1/One imperial gallon equals 1.20094 U.S. gallons.

where the ice is heavy and rugged. The Harps are mild, docile, and gregarious, probably coming from the more sheltered recesses of Hudson's Bay. Late in October, both leave the ice and start south, the Hoods crossing from Greenland to Labrador, where they meet the Harps. From then on they seem to travel in two long, parallel columns, the Hoods always taking the outer or seaward position. Thus they move slowly in a southerly direction until they reach the great Ocean Banks off Cape Race.

Returning north, they again mount the ice about the end of February, in the neighborhood of the Straits of Belle Isle. This is the whelping season, and the seal hunt begins as soon as the young are about a month old.



Survivor of Newfoundland's Once Great Sealing Steamer Fleet

The Newfoundland seal hunts have commenced early in March and have been attended with great pomp and ceremony. It is said that old sealing captains possess an instinct which annually leads them to the seal herds. Usually the seals have been located in the vicinity of Funks Islands, between 50 and 100 miles off Notre Dame Bay, on the northeastern coast of Newfoundland.

No scientific studies of the growth and movement of seals in Newfoundland waters have ever been made.

The sealing industry has, in the past, been an important source of earning power. At the beginning of this century, the industry was giving direct employment, for nearly two months, to about 3,500 men and to many more by indirect employment.

The main reasons that have been given for the decline of this industry are:

1. The high cost of outfitting and repairing ships caused largely by taxation--a very large proportion of the principal items required in connection with outfits and repairs being subject to considerable taxation.

2. Heavy direct taxation on profits in successful years without consideration or allowance for losses on the venture in other years.

3. The closing of the United States market to Newfoundland seal oil by the imposition of a prohibitive tax as a processing tax, since the inauguration of which several years ago absolutely no seal oil has been sold there, whereas previously 50% or more of the seal oil production was sold there.

Lack of government interest in fostering the sealing industry has been largely responsible for the recent decline of the seal-fishery. No protest has been made by the Government to the United States with respect to the prohibitive processing tax.

However, it is widely believed--even in seal-fishery circles--that the primary reason for the decline of the Newfoundland seal-fishery has been a natural depletion in the seal herds; yet this factor is not listed among the three main reasons leading up to the decline of the seal-fishery.

The Board of Trade Committee, consisting of leaders in the sealing industry during recent years, makes the following statement in its report:

"It seems rather obvious that the aerial survey is of great importance before anything else is done, as there seems to be a general opinion that the seal herds have been very seriously reduced in recent years. A thorough survey can be made and this point cleared up."

Newfoundland Seal Hunters at Work

It is reported that only one steamer is scheduled to engage in the seal-fishery during 1946. The probability is that several motor vessels will also engage in the seal-fishery, definite plans having been made for four such vessels to leave.

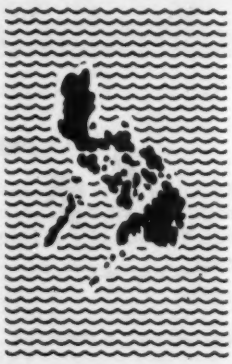
The seal-fishery has perhaps never been an industry of major importance in Newfoundland. In terms of money, the industry has always been small compared to the cod-fishery. Nevertheless, the industry has had a two-fold value: It has given direct employment to several thousands of men during the off-season, and it has given indirect employment through a large part of the year to shipbuilders, blacksmiths, and engineers.

What is really needed at the present time, however, is a careful and disinterested governmental study of the seal-fishery. Such a study should be sufficiently thorough to cover an analysis of results for past seasons, a careful consideration as to the types of vessels which should be employed, and recommendations as to government fiscal policies. Recent aviation developments, in addition, should make it possible for the Government to conduct a highly useful series of aerial surveys.

A favorable report by the Government might well lead to the revival of a seal-fishing industry, which is nearly as old as Newfoundland itself, and which has a very real potential value to the economy of Newfoundland.

Philippines

SURVEY OF FISHERIES: A 4-month field survey of the commercial fishing industry of the Philippine Islands has been undertaken by the Fish and Wildlife Service, U.S. Department of the Interior, to determine what equipment, materials, and funds will be needed to restore the fisheries to early production, according to an announcement by that Department on March 3.



The fishing industry of the Philippines, normally one of the chief sources of protein foods in the Islands, was completely destroyed by combat action and by vandalism and confiscation by the Japanese occupation troops, and practically no vessels, fishing gear, or shore facilities remain.

The survey is being undertaken at the direction of President Truman, who also requested the Secretary of the Navy and the Secretary of War to cooperate by providing assisting personnel from their Departments, as well as transportation and other facilities. The survey has also been welcomed by the United States High Commissioner to the Philippines, and the President of the Philippines, as promising much needed assistance to the war-torn Islands.

Because of the critical food situation in the Philippines, the immediate restoration of the fisheries to productiveness is regarded as essential. It is believed that this can be accomplished in much less time than will be required to reestablish other sources of protein foods and of adequate agricultural crops.

OYSTER ENEMIES

The chief enemy of the oyster is the starfish, which infests the productive oyster beds in Buzzards Bay, Narragansett Bay, and Long Island Sound, and consumes hundreds of thousands of bushels of oysters annually. This pest can be reduced by mopping, dredging, or by spreading lime over oyster grounds.

The oyster drill, a marine snail widely distributed on the coast, and particularly abundant in the New England and Middle Atlantic States and in the lower part of the Chesapeake Bay, consumes a million dollars worth of oysters annually in Delaware Bay alone. It has been spread by careless oyster planting, not only along the Atlantic Coast, but on the Pacific Coast as well, and to Europe. Drills can be controlled by trapping and by the use of a special dredge; but coordinated and well planned State-wide or interstate campaigns are necessary to achieve success in destroying the centers of infestation.

Conch, drumfish, and various skates or rays frequently attack oyster beds in the Gulf of Mexico, devouring tremendous quantities. Oyster planters construct elaborate fences to keep the fish away and even resort to dynamiting to eliminate drums. Among the birds, the scaup duck is notorious for consuming large quantities of small oysters exposed at low tide.

Besides these enemies which actually devour oysters, are many parasites and commensals which invade the tissues and shells and impair the quality of oyster meat. Many other creatures compete with the oyster for space, and wreak damage by fouling the shells planted to catch set, or by smothering the young after they have attached themselves.

Senate Document No. 51

FEDERAL LEGISLATION, DECISIONS, ORDERS, ETC.

Civilian Production Administration

CANS: The Civilian Production Administration, on March 1, issued a revised M-81, the metal container conservation order, and on March 4 published a revised version of Direction 9 to M-81.

The revised M-81 re-establishes packing quotas for the various commodities which may be canned. Most fishery items are entitled to unlimited quotas, but ground fish is permitted only 100 percent of the 1945 pack and codfish cakes, crawfish, eels, finnan haddie, and lobsters are restricted to 50 percent of the 1941 figure. By a provision grading the sequence of manufacture and delivery, the order also places these products at a disadvantage under items entitled to unlimited quotas.

Direction 9, revised, permits steel producers to set aside 15 percent of their monthly tin mill production for uses other than the production of containers for seasonable and perishable food products, drugs, medicinals, and biologicals. Formerly, 100 percent was required for these products.

OIL IMPORTS: Removal of import controls on fish liver oil and shark liver oil, important sources of the disease-resistant vitamin A, were announced by the Civilian Production Administration on March 1. This relaxation was effected through a revision in the General Import Order M-63.

CPA's action followed the recent move of the Combined Food Board in removing these two oils from international allocation. The Board reported that the supply and demand for these oils were virtually in balance.

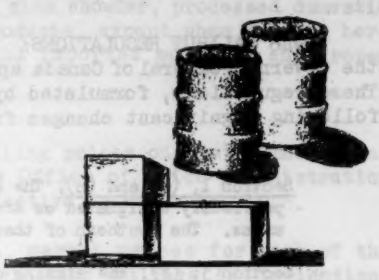
Fish liver oils, including shark liver oil, were placed under international allocation control on January 12, 1944, when a tight supply situation made it necessary to protect the needs of the armed forces.

Department of Agriculture

CONTAINERS: The fishery industry faces a serious shortage of wooden and fiber containers for the next several months, the U.S. Department of Agriculture announced on March 7. Production of such containers is far below normal, and no improvement can be expected until fall.

USDA urged the industry to conserve and re-use old containers wherever possible, to anticipate requirements for new containers, to place orders promptly, and to take delivery of containers whenever and wherever they are available.

Shortages of logs and labor, bad weather, and other factors were blamed for the reduced output of wooden containers. The tinplate supply situation is also reported as tight, but officials are confident that the fishery industry's seasonal requirements for tin cans, particularly for quality fish, will be met.



The USDA advised that, where members of the industry are unable to obtain containers after exhausting known sources of supply, the matter should be promptly reported to the Fish and Fish Products Division, Special Commodities Branch, Production and Marketing Administration, Washington 25, D.C. Such action will not assure a supply of containers, but the Branch will endeavor to locate and direct movements of new and used containers to areas of extremely short supply.

MARINE PAINTS: The U. S. Department of Agriculture, on March 15, announced that beginning March 16, 1946, the use of fats and oils in marine paints will be exempted from quota restrictions imposed by WFO-42a, provided manufacturers accompany their quarterly use report FDO-42-4 with a certification of such oil use from the War Shipping Administration.

The minimum amount of fats and oils any manufacturer, operating under the order, may use was increased from 15,000 to 20,000 pounds per quarter, for all purposes.

SARDINE IMPORTS: The U. S. Department of Agriculture announced on March 26 that approximately 7.6 million pounds (325,000 cases) of canned sardines from Portugal and Spain and their colonies have been recommended for allocations to the United States by the Combined Food Board. This is an increase of more than 50 percent over the quantities which were available last year.

Imports into the United States of these products will make possible compensating shipments of less expensive fish to needy European countries. The shipments will be divided as follows: 250,000 cases from Portugal and its colonies and 75,000 cases from Spain and its colonies. The types of sardines that may be imported will be limited to boneless and boneless-and-skinless sardines, packed in 3⅜ ounce (Dingley) cans.

Authorizations to import these fish will be granted, as far as practicable, only to qualified importers on the basis of their historical records of importations. The years 1938-44, inclusive, have been determined to constitute the base period, but an importer may select any three consecutive years of that period to represent his individual base period. Prospective qualified importers, or their agents, must provide and export the tinplate necessary for the packing of the sardines.

International Fisheries Commission

1946 HALIBUT REGULATIONS: On March 6, the President of the United States and the Governor-General of Canada approved the 1946 Pacific Halibut Fishery Regulations. These regulations, formulated by the International Fisheries Commission, had the following significant changes from the regulations in force in 1945:

Section 1, (b) and (c). The section of the coast, south of Willapa Harbor, previously designated as Area 1, is divided at Cape Blanco Light into two areas. The southern of these is designated Area 1A and the northern, Area 1B.

Section 3, (b). The closing date of Area 2 or Area 3, whichever is later, is applied to Areas 1A and 4 and the closing date of Area 2 is applied to Area 1B.

Section 4, (e). The halibut license of any vessel fishing for halibut in Area 1A, after the closure of Areas 1B and 2, must be validated at a port or place within Area 1A prior to each fishing trip.

Section 5, (a). This provision, which allows a setline vessel fishing under permit for other species in areas closed to halibut fishing to retain for sale one pound of halibut for each seven pounds of saleable fish of other species, is amended to allow a vessel with a permit to possess more halibut than it can sell legally, provided such additional halibut does not exceed 30 percent of the amount of halibut that can be sold. Such additional halibut must be forfeited and surrendered at the time of landing.

Section 5, (c). The captain of a vessel fishing under permit and the dealer purchasing the catch of such a vessel are both made responsible for reporting the arrival of the vessel to an enforcement officer and for securing from him permission to unload, before unloading begins.

Section 6, (g). The permit of any vessel becomes invalid if the vessel has in its possession more halibut than is allowed under paragraph (a) of Section 5.

Section 7, (a). A section of the 1945 paragraph is deleted to make it necessary for all licensed vessels to make statistical return at the end of each trip. Previously, vessels fishing for halibut in areas without catch limits did not need to make statistical return unless requested to do so.

Section 8, (b). Dealers are required to make statistical return on each permit trip, certifying that they had reported the arrival of the trip and had secured permission to unload it before unloading began.

Office of Price Administration

EXEMPTIONS AND SUSPENSIONS: Removal of price control from fifteen miscellaneous commodities, most of which were food items, was announced on March 20, 1946, by the Office of Price Administration in Amdt. 20 to SO-132, effective on March 25, 1946.

The items exempted from price control included:

Domestic dried shark fin, canned carp, canned clam chowder, processed domestic and imported lobster and spiny (rock) lobster products, except when sold in hermetically sealed containers, canned domestic and imported mussels, and frozen oyster stew.

OYSTERS AND CLAM SHELLS: Suspension of ceiling prices on oyster shells and clam shells will be continued indefinitely, the Office of Price Administration announced on March 15 in Amdt. 21 to SO-132, effective on March 15, 1946.

Since the date of the original suspension, market prices for each of the commodities have remained below the level of pre-existing ceilings, and indications are that prices will continue at or below ceiling levels, OPA stated.

CRABMEAT: Exemption of frozen, canned, and fresh crabmeat from price control on March 29, 1946, was announced March 29 by the Office of Price Administration when issuing Amdt. 23 to Supplementary Order 132.

The agency explained that this action was being taken because crabmeat is a luxury item used mostly by hotels, with no significance in the cost of living.

Ceilings on crabmeat had been suspended since October 31, 1945.

FRESH AND FROZEN FISH AND SEAFOODS: Amdt. 17 to MPR-579, effective March 15, 1946, changes the regulation governing fresh and frozen fish and shellfish, the Office of Price Administration announced on March 15.

The action was as follows:

1. Inland wholesalers of frozen fish who, prior to April 13, 1943, brought more than 50 percent of any species in carload lots, and who have substantial connections with coastal suppliers, are prohibited under the action from using Column V prices to sell that species to other--usually smaller--independent inland wholesalers.

They must sell no higher than the Column IV level, OPA ruled.

OPA explained that Column I to Column V price levels are processor and distributor prices starting with Column I prices charged by the coastal supplier and working up, through distributor levels, to Column V prices--charged by the final distributor to the retailer and purveyor of meals.

2. Furthermore, by the action any inland wholesaler who, during the past year, received 20 percent or more of a species of fish from New England or (in the case of West Coast shipments) from the Pacific Coast, or by imports from foreign suppliers, must sell at a price no higher than the Column IV level (or Column II in the case of importers).

Previously, independent wholesalers were allowed to charge Column V prices for certain types of sales regardless of size and connections with coastal suppliers.

The action preserves the two established levels of maximum prices for inland wholesalers, OPA said, by more effectively restricting Column V prices to small inland operations and to wholesalers dependent on large inland distributors for their frozen fish supplies.

The Column IV level applies to inland wholesalers with access to sufficient supplies from the coasts as to enable them not only to supply their own retailer and institutional trade (purveyors of meals), but also to supply smaller inland wholesalers.

3. In accordance with a recent Emergency Court of Appeals decision in the case of Booth Fisheries Corporation, the status of inland wholesale branches, owned and operated by coastal processors of frozen fish and competing with independent inland wholesalers, was clarified.

Formerly, OPA had ruled that Booth Fisheries could not charge Column V prices because its inland wholesale branches were not in the category of independent operators, who were permitted to charge high-level prices, regardless of their size and connections with coastal suppliers.

The Court, however, ruled that Booth Fisheries should be allowed the Column V prices where its operations were the same as the operations of competing wholesalers who could charge Column V prices.

4. The action also permits Booth Fisheries Corporation, for the first time, to use the highest level of prices (Column G) for fresh (non-frozen) fish, as in the case of the independent inland wholesalers.

5. Prices are established on parchment-wrapped and cellophane-wrapped packages of frozen fish packed in two-pound wood or paper boxes. An addition of one and one-half cents per pound is allowed for cellophane-wrapped packages, and one and one-quarter cents for parchment-wrapped packages.

Although no United States processor of frozen fish as yet uses the two-pound package, imports from Iceland are received in this manner. The action establishes prices in the event domestic processors produce a similar package.

Treasury Department

DOGFISH-LIVER OIL: The Treasury Department, on March 8, 1946, instructed its collectors of customs to classify dogfish-liver oil under paragraph 34, Tariff Act of 1930, and section 2491 of the Internal Revenue Code. The text of the order follows:

TREASURY DEPARTMENT,
OFFICE OF THE COMMISSIONER OF CUSTOMS,
Washington, D. C.

To Collectors of Customs and Others Concerned:

In C. D. 949, the U. S. Customs Court held certain dogfish-liver oil, extracted from natural dogfish livers and containing medicinal properties, to be free of duty under paragraph 1669, Tariff Act of 1930, as a crude drug of animal origin, not advanced in value or condition beyond that essential to the proper packing of the drug and the prevention of decay or deterioration pending manufacture. In reaching that decision, the court overruled the collector's classification

of the oil as a drug advanced in condition, dutiable under paragraph 34 of the tariff act at 10 per centum ad valorem.

The Assistant Attorney General in charge of customs litigation proposes to present a new case to the court covering the issue involved in C. D. 949. Therefore, the ruling in that case shall be confined to the merchandise specifically involved therein. Other merchandise such as and similar to the oil dealt with in the cited case shall be classified under paragraph 34 at 10 per centum ad valorem.

Such and similar merchandise shall also be assessed with a tax under section 2491 of the Internal Revenue Code, as modified pursuant to the Canadian Trade Agreement, following C. A. D. 285.

(418.141)

W. R. JOHNSON,
Commissioner of Customs.

Approved March 8, 1946:
JOSEPH J. O'CONNELL, Jr.,
Acting Secretary of the Treasury.

War Department

ALASKAN RESTRICTIONS: The War Department, on March 6, 1946, announced the revocation of an amendment approved on December 4, 1942, postponing for the duration of the war and six months thereafter, the effective date of the regulations and conditions approved on October 14, 1940, to govern the placing and maintenance of fishing structures in the coastal waters of Alaska and navigable waters tributary thereto. The regulations and conditions were declared to be again in full force and effect.

RECENT FISHERY PUBLICATIONS

Listed below are informational publications which recentlyhave been processed by the Division of Commercial Fisheries. FL publications are available, free of charge, from the Fish and Wildlife Service, Merchandise Mart, Chicago 54, Ill. Other listed publications may be obtained, also free of charge, from the Division of Commercial Fisheries, Fish and Wildlife Service, Washington 25, D. C.

Number	Title
CFS-242	- Fish Meal and Oil, November 1945
CFS-249	- Vitamin A Report, November 1945
CFS-251	- Fish Meal and Oil, December 1945
CFS-252	- Frozen Fish, February 1946
CFS-257	- Frozen Fish, March 1946
FL-177	- Progress Report on Tests in Commercial Fisheries of Cordages Made from Various Fibers
FL-178	- Partial List of Fishing Boat Builders
FL-181	- Fish Can Be Stored in Refrigerated Lockers with Other Foods
MDL-1 (Revised)	- Partial List of Producers and Distributors of Frozen Packaged Fishery Products
MDL-5 (Revised)	- Georgia Frozen Food Locker Plants
MDL-13 (Revised)	- New York State Frozen Food Locker Association

Designations for fishery publications are interpreted as follows:

CFS - Current fishery statistics of the United States and Alaska.

SL - Statistical lists, consisting of lists of dealers of fishery products and manufacturers of byproducts.

FL - Fishery leaflets.

MDL - Market development lists of frozen food locker plants and locker associations.

Compositor: Jean Zalevsky

THE CHESAPEAKE BAY SOFT CRAB INDUSTRY

During June, a visitor to New York's Fulton Market, Philadelphia's Dock Street Market, or Baltimore's Public Market will observe hundreds of boxes of soft-shell crabs being sold daily, because, while the soft crab season extends from April to November, it is usually during this month, climaxing about the Fourth of July, that soft-shell crabs are most popular as a seafood and command the highest prices. The soft crab that the visitor sees sold in these and other seafood markets is the blue crab, Callinectes sapidus, which, while known from Cape Cod to Texas, is especially important in the Chesapeake Bay area on the Atlantic Coast, where a large industry is conducted in the catching and marketing of this delicious crustacean.

Fishery Leaflet 184, issued by the Fish and Wildlife Service, discusses the history and development of the blue crab industry in the Chesapeake Bay area. It also describes the preferred methods and types of gear used in crab fishing. This leaflet is available, free of charge, from the Fish and Wildlife Service, Merchandise Mart, Chicago 54, Illinois.

FISH COOKERY IN THE OPEN

While certain principles of fish cookery apply to all conditions under which food is prepared for the table, variations in detail are required in outdoor life. A single camper necessarily limits his equipment, supplies, and methods for preparing food. For a party of six or

eight, a wider range of activity is possible, yet camp organization and equipment must still be somewhat limited to easily portable or improvised material. For club or community camps, the maintenance of health requires careful organization, supervision, and more or less permanent equipment and construction.

A 27-page leaflet of information on fish cookery in the open, which discusses the camp, cooking fire, preparation of fish, and preservation of perishable food on hand and lists many recipes adaptable to outdoor cookery, has been issued by the Fish and Wildlife Service as Fishery Leaflet 35. This leaflet may be obtained free of charge from the Service's headquarters, Merchandise Mart, Chicago 54, Illinois.

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